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MONITORING OF SITES AND HABITAT FOR THREE ANNEX II SPECIES OF WHORL SNAIL (*VERTIGO*) (IWM 104). APPENDIX IV. *VERTIGO ANGUSTIOR* SITE REPORTS

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An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

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Coastal heath, Howth Head, Co. Dublin, Maurice Eakin; **Red Squirrel** *Sciurus vulgaris*, Eddie Dunne, NPWS Image Library; **Marsh Fritillary** *Euphydryas aurinia*, Brian Nelson; **Puffin** *Fratercula arctica*, Mike Brown, NPWS Image Library; **Long Range and Upper Lake**, Killarney National Park, NPWS Image Library; **Limestone pavement**, Bricklieve Mountains, Co. Sligo, Andy Bleasdale; **Meadow Saffron** *Colchicum autumnale*, Lorcan Scott; **Barn Owl** *Tyto alba*, Mike Brown, NPWS Image Library; **A deep water fly trap anemone** *Phelliactis* sp., Yvonne Leahy; **Violet Crystalwort** *Riccia huebeneriana*, Robert Thompson

Main photograph:

Habitat at Malin Dunes (VaCAM12), Co Donegal, June 2016, John T. Brophy

Monitoring of sites and habitat for three Annex II species of whorl snail (*Vertigo*) (IWM 104). Appendix IV. *Vertigo angustior* site reports

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Introduction

This Appendix to the main report on the *Vertigo* habitat and site monitoring project contains the individual reports for *Vertigo angustior* sites. These have been generated from the Microsoft Access database as part of the Vertigo National Monitoring Project. Each site report provides the results from the current monitoring survey (2014-2017) and the previous monitoring survey (2008-2010). These reports should be read in conjunction with the main report. Note that the correction of errors or omissions from the data relating to the previous monitoring period was not part of the current project and so may still be present within the site reports.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Beal Point

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM01 **County:** Kerry

SAC Site Code: 002165 Lower River Shannon

Location description (from baseline survey):

Vertigo angustior habitat is present throughout much of the fixed dune system but is most frequent in the central part of the site. Access is from the beach carpark at the western end of the site at Q895482 or from the minor farm road at Q904486

Monitoring period	Date surveyed	Recorders
2013-2018	22-23 July 2014	John Brophy & Maria Long
2007-2012	05 August 2008	E A Moorkens & I J Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). There is also some potential habitat within the ecotone between the fixed dunes and the dune slack at the south-eastern part of the site, and also within the ecotone of Potentilla anserina grassland between the fixed dunes and the estuary. The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is Festuca rubra, with some Ammophila arenaria, corresponding to SD7 of Rodwell (2000), and Lotus corniculatus, Pilosella officinarum, Trifolium repens, Galium verum, and Euphrasia lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra, with sparse Ammophila arenaria, Geum verum, Euphrasia sp. Pilosella officinarum and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

The population of Vertigo angustior at Beal Point appears to be very limited geographically, with two recent surveys finding the snail only in the very central section of the site. This make the population quite vulnerable. Lack of grazing is the most serious issue affecting the site, and all three polygons would benefit from an increase in grazing level. This change in management should be instigated immediately and in conjunction with the landowner/manager, and should be monitored regularly to ensure a successful outcome. This is particularly important given the fact that in the past (reported in Moorkens & Killeen, 2011) this site was damaged by grazing levels which were too high. This site is probably capable of good recovery, and also likely to be able to support a good population of Vertigo angustior, but this will only be the case with an appropriate grazing regime in place.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	Q 90321 48704	Top of dune crest	
End point:	Q 90479 48741	Gentle, east-facing slope. Fenceline from 2008 gone.	
Transect length:	163	**Direction:**	As for 2008
Description:	As for 2008		
Sampling frequency:	As for 2008		

Vertigo angustior monitoring at Beal Point

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point: Q 90319 48708 Top of dune crest

End point: Q 90478 48740 Fenceline

Transect length: 163 **Direction:** West to east

Description: The transect runs across undulating Festuca rubra dominated fixed dune grassland, from a high dune crest through hollows and up slopes including east and west facing slopes.

Sampling frequency: Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Seven samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	21.0821	Polygon A status remains Optimal-Suboptimal. It is the largest area, containing the best expanses of fixed dune habitat.
B	Suboptimal-Unsuitable	2.8519	Polygon B status remains Suboptimal-Unsuitable, but area at western end removed as unsuitable due agricultural nature.
C	Suboptimal	6.3651	Polygon C status upgraded from Suboptimal and Unsuitable to Suboptimal. Undergrazed, but good potential for Vertigo angustior. Small area of unsuitable land removed at east of polygon - bare sand & agricultural.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal with optimal areas	21.0941	The western polygon is not at its best potential due to rankness of vegetation through lack of grazing.
B	Sub-optimal with unsuitable areas	3.5462	xxxx
C	Sub-optimal with unsuitable areas	10.1403	

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		72.5m	20.5m	66m	4m	159m		4m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	48.5m	NA	54.5m	NA	59.8m	133.2m	26m	3.8m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 Transect 1 (7 samples)							
2013-2018	1	1	13m	1	0	1	Optimal-Suboptimal
2013-2018	1	2	26 m	4	0	4	Suboptimal
2013-2018	1	3	40 m	2	0	2	Optimal-Suboptimal
2013-2018	1	4	50 m	1	1	2	Optimal-Suboptimal
2013-2018	1	5	78 m	0	0	0	Suboptimal
2013-2018	1	6	99 m	0	0	0	Optimal-Suboptimal
2013-2018	1	7	139 m	1	0	1	Suboptimal
Monitoring period 2007-2012 Transect 1 (7 samples)							
2007-2012	1	1	1m along transect	0	0	7	
2007-2012	1	2	20m along transect	0	0	7	
2007-2012	1	3	35m along transect	0	0	1	

2007-2012	1	4	52m along transect	0	0	5		
2007-2012	1	5	68m along transect	0	0	0		
2007-2012	1	6	96m along transect	0	0	3		
2007-2012	1	7	160m along transect	0	0	0		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 (10 samples)							
2013-2018	01	Q 89639 48345	0	0	0		Suboptimal-Unsuitable
2013-2018	02	Q 89694 48383	0	0	0		Suboptimal
2013-2018	03	Q 89788 48452	0	0	0		Suboptimal
2013-2018	04	Q 89939 48547	0	0	0		Optimal-Suboptimal
2013-2018	05	Q 90128 48671	0	0	0		Suboptimal
2013-2018	06	Q 90300 48726	1	0	1	Presence/absence	Suboptimal
2013-2018	07	Q 90905 48562	0	0	0		Optimal-Suboptimal
2013-2018	08	Q 90803 48534	0	0	0		Optimal-Suboptimal
2013-2018	09	Q 90611 48711	0	0	0		Suboptimal
2013-2018	10	Q 90503 48650	0	0	0		Optimal-Suboptimal
Monitoring period 2007-2012 (13 samples)							
2007-2012	01	Q 90315 48704	0	0	0		
2007-2012	02	Q 90246 48694	0	0	0		
2007-2012	03	Q 90300 48653	0	0	0		
2007-2012	04	Q 90326 48767	0	0	2		
2007-2012	05	Q 90372 48678	0	0	4		
2007-2012	06	Q 90428 48785	0	0	0		
2007-2012	07	Q 90556 48690	0	0	0		
2007-2012	08	Q 90467 48652	0	0	0		
2007-2012	09	Q 90127 48677	0	0	0		
2007-2012	10	Q 89741 48392	0	0	0		
2007-2012	11	Q 89687 48375	0	0	0		
2007-2012	12	Q 89641 48341	0	0	0		
2007-2012	13	Q 89587 48280	0	0	0		

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2-3 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 4 of the 8 maritime grassland zones (from 0-107 m) with habitat Suboptimal or better	Present in 5 of the zones	Pass
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 4 of the 8 maritime grassland zones (from 0-107m) with optimal or sub-optimal habitat	Present in all 4 zones	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	Target 1: Adult or sub-adult snails are present in 4 of the 5 samples from Polygons A and C	Present in one spot sample (6 samples)	Fail

2013-2018	Presence/Absence	Target 2: Adult or sub-adult snails are present in at least 2 samples of the most suitable habitat in Polygon B (minimum 4 samples)	Absent (4 samples)	Fail
2007-2012	Presence/Absence	Target 1: Adult or sub-adult snails are present in 4 of the 5 samples of the optimal habitat	Present at 2 other locations	Fail
2007-2012	Presence/Absence	Target 2: Adult or sub-adult snails are present in at least 2 samples of the most suitable habitat in the western polygon (minimum 4 sample)	Absent	Fail

Mon. period	Population Notes
2013-2018	The snail was once again found in multiple samples along the transect, and in a sample nearby, but not from any other area of the site. This is remarkably similar to the findings in 2007-12, and suggests that the snail is largely limited to the central section of the dune system.
2007-2012	The snail is scattered in its distribution and present in low numbers.

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	45m of habitat along the first 107m of the Transect is classed as Optimal AND 125m of habitat along the Transect is classed as Suboptimal or better	0 m Optimal and 93 m Suboptimal or better	Fail
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (Optimal wetness) and covered with a layer of humid thatch for 100 m of the first 107 m along the Transect	103 m Optimal wetness	Pass
2007-2012	1	Habitat extent	45m of habitat along the first 107m of the Transect is classed as Optimal and 125m of habitat along the Transect is classed as Sub-Optimal or Optimal	48.5m is Optimal AND 133.2m is Sub-optimal or Opt	Pass
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 100m of the first 107m along the Transect	103.2m is Optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	23-25ha of the site sub-optimal with optimal areas	21.08ha Optimal-Suboptimal and 6.37 ha Sub-optimal	Pass
2007-2012	Habitat extent	23-25 ha of the site sub-optimal with optimal areas	21.1 ha	Fail

Mon. period	Habitat Notes
2013-2018	The upgrading of Polygon C from Sub-optimal and Unsuitable to Suboptimal means that there has been an increase in the area of potentially suitable habitat at the site. Management issues still remain throughout this site, however.
2007-2012	The western polygon is not as good as its best potential due to rankness of vegetation through lack of grazing. It has deteriorated since 2003.

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.03	abandonment of pastoral systems, lack of grazing	Inside	High	Negative	90%	

2013-2018	D01.01	paths, tracks, cycling tracks	Inside	Low	Neutral	1%	
2013-2018	G02.08	camping and caravans	Inside	Low	Neutral	<1%	
2013-2018	K01.01	Erosion	Inside	Low	Negative	5%	
2013-2018	K04.05	damage by herbivores (including game species)	Inside	Low	Positive	3%	Rabbits
2007-2012	A04.03	abandonment of pastoral systems, lack of grazing	Inside	Medium	Negative	77%	Lack of grazing management, such that the vegetation is becoming taller and ranker, and encroached by scrub and bramble (especially at the western end, and in the more marginal areas). In 2003, there was some cattle grazing but no evidence in 2008.
2007-2012	A05.02	stock feeding	Inside	Low	Neutral	78%	In 2003, there was damage through supplementary feeding but this was not evident in 2008.
2007-2012	A08	Fertilisation	Inside	Low	Negative	78%	In 2003, there was damage through slurry spreading

Mon. period	Future Prospects Notes
2013-2018	Lack of grazing management is the main issue facing this site, as it was in 2007-12, with some areas becoming rank and dominated by brambles. This site still holds areas of good quality habitat and has potential for recovery so has been assessed as Unfavourable Inadequate (amber).
2007-2012	The habitat quality should improve quickly if grazing management resumes, but would continue to deteriorate if the absence of sufficient grazing continues.

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Amber	Amber	Amber	Amber
2007-2012	Amber	Amber	Amber	Amber

Mon. period	Overall Notes
2013-2018	The site is quite undergrazed, and Vertigo angustior is concentrated in its distribution and present in rather low numbers. Due to these factors and the low area of optimal habitat, the overall assessment is Unfavourable Inadequate (amber).
2007-2012	

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: Areas of habitat which appear suitable for Vertigo angustior are found throughout much of the fixed dune system at this site. However, the snail appears to be confined to the central part. Both the 2007-12 and 2013-18 surveys show positive samples only from this central area.

Discussion:

The population of Vertigo angustior at Beal Point appears to be very limited geographically, with two recent surveys finding the snail only in the very central section of the site. This makes the population quite vulnerable. Lack of grazing is the most serious issue affecting the site, and all three polygons would benefit from an increase in grazing level. This change in management should be instigated immediately and in conjunction with the landowner/manager, and should be monitored regularly to ensure a successful outcome. This is particularly important given the fact that in the past (reported in Moorkens & Killeen, 2011) this site was damaged by grazing levels which were too high. This site is probably capable of good recovery, and also likely to be able to support a good

population of Vertigo angustior, but this will only be the case with an appropriate grazing regime in place.

Monitoring recommendations:

Monitor again, following the same protocol as for 2014, in three years time. If grazing is re-instated and site condition improves, then monitoring interval can be reviewed. However, moving to a longer interval (e.g. six years) would run the risk of missing deterioration if grazing were to cease again in the future.

Monitoring as follows:
Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too wet, Optimal wetness or Too dry, respectively
- Take at least 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations (should include sites to west and east of the transect, and include Polygon B) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

Lack of grazing is the most serious issue affecting this site. Moorkens & Killeen (2011) made detailed recommendations on grazing conditions to be implemented, and as these are still relevant and still needed, they are reproduced here: The site needs to be grazed by cattle with no more than 0.8 livestock units per hectare, and grazing periods should typically be in the spring to autumn periods, with animals removed for the winter. Livestock should be young suckler or mixed age cattle. There should be no supplementary feeding of animals within the Vertigo angustior habitat, with animals removed at the first signs of hunger. Sacrificial areas for supplementary feeding outside the optimum Vertigo angustior habitat could be considered, if appropriate to the objectives of the other features of the SAC. There should be no improvement with fertiliser or drainage of any of the habitat area.

2007-2012

Area of occupancy: Vertigo angustior habitat is present throughout much of the fixed dune system but is most frequent in the central part of the site. Access is from the beach carpark at the western end of the site at Q895482 or from the minor farm road at Q904486

Discussion:

A management programme needs to be introduced as a matter of priority. The site needs to be grazed by cattle with no more than 0.8 livestock units per hectare, and grazing periods should typically be in the spring to autumn periods, with animals removed for the winter. Livestock should be young suckler or mixed age cattle. There should be no supplementary feeding of animals within the Vertigo angustior habitat, with animals removed at the first signs of hunger. Sacrificial areas for supplementary feeding outside the optimum V. angustior habitat could be considered, if appropriate to the objectives of the other features of the SAC. There should be no improvement with fertiliser or drainage of any of the habitat area. Given the evidence for an overall deterioration in the Condition of the site, both in terms of habitat and Vertigo angustior distribution and abundance, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management.

Monitoring recommendations:

Management recommendations:

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Derrynane

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM02 **County:** Kerry

SAC Site Code: 002158 Kenmare River

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	13-14 July 2015	John Brophy & Maria Long
2007-2012	11-12 August 2008	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitats in which Vertigo angustior is present are the fixed grey dunes (Annex I 2130, CORINE 16.22) and the ecotone between the fixed dunes and the dune slack (Annex I 2190, CORINE 16.3) below (Romão, 1996; Devillers et al., 1991). Although the snails are not present in the dune slack and inundated lake, the presence of these wet areas is essential for the humid habitat the species lives in. The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of this unshaded habitat. The dominant vegetation is Festuca rubra, with Ammophila arenaria higher up, corresponding to SD7 of Rodwell (2000), and Lotus corniculatus, Plantago lanceolata, Trifolium repens, Galium verum and Viola tricolour lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra, with sparse Ammophila arenaria, Geum verum, Euphrasia sp. Lotus corniculatus and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

The area mapped as having potential habitat for Vertigo angustior at this site was expanded significantly. The species was found in two sample locations relatively distant from what had originally been understood to be its core area. Overall however, this site needs some changes in management to continue to provide suitable habitat for the species. This involves immediately relaxing the grazing regime across much of the area to allow the growth of grasses (particularly Ammophila arenaria and Festuca rubra) and also to allow the build-up of Festuca rubra thatch in places. In contrast, at the south-western end, grazers may need to be introduced as Ammophila arenaria is quite rank there.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point: V 53484 58430 Approximately 2.5 m up from base of the dune face

End point: V 53505 58435 Approximately 2.5 m up from base of the dune face

Transect length: 21 **Direction:** West to east

Description: South-facing dune bank with marram, Festuca rubra, Galium verum, Lotus corniculatus, Euphrasia, Viola tricolour

Sampling frequency:

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point: V 53484 58430 Approximately 2.5m up from the base of the dune face

End point: V 53505 58435 Approximately 2.5m up from the base of the dune face

Transect length: 21 **Direction:** West to east

Description: South-facing dune bank with marram, Festuca rubra, Galium verum, Lotus corniculatus, Euphrasia, Viola tricolour

Sampling frequency: 3 samples were taken at the start middle and end of the transect approximately 2.5m above the break in slope. Two further samples were taken half way along the transect, one 2m above the transect line and one 2m below the line.

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Vertigo angustior monitoring at Derrynane

Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	7.686	Polygon A status remains Suboptimal. Boundary extended to include larger area of fixed dune grassland. Habitat consisted mostly of areas of short vegetation, which, while species-rich, are low in grass species, and low in thatch. The western strip, however, is too rank in places and gets much less grazing.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
	Sub-optimal	1.94	The actual area of dune currently inhabited by Vertigo angustior is around 100m2. However, there is 1.94ha of habitat with potentially suitable (sub-optimal) V. angustior habitat.

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		5m	16m			13m		8m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	21m	NA		NA		21m		

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 Transect 1 (5 samples)								
2013-2018	1	1	0m	0	0	0	Count	Suboptimal
2013-2018	1	2	14m	0	0	0		Suboptimal
2013-2018	1	3	21m	9	0	9	Count	Optimal-Suboptimal
2013-2018	1	4		0	0	0	Count	Suboptimal
2013-2018	1	5		0	0	0	Count	Suboptimal
Monitoring period 2007-2012 Transect 1 (5 samples)								
2007-2012	1	1	0m	0	0	8		
2007-2012	1	2	11m	0	0	10		
2007-2012	1	3	21m	0	0	14		
2007-2012	1	4	11m and 2.5m upslope	0	0	4		
2007-2012	1	5	11m and 2.5m downslope	0	0	3		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 (6 samples)							
2013-2018	01	V 53434 58354	13	0	13	Count	Suboptimal
2013-2018	02	V 53337 58544	0	0	0	Count	Optimal
2013-2018	03	V 53413 58504	0	0	0	Count	Suboptimal
2013-2018	04	V 53523 58377	18	0	18	Count	Optimal-Suboptimal
2013-2018	05	V 53589 58380	0	0	0	Count	Optimal-Suboptimal
2013-2018	06	V 53575 58214	4	0	4	Count	Optimal
Monitoring period 2007-2012 (6 samples)							
2007-2012	01	V 53298 58537	0	0	0		
2007-2012	02	V 53435 58477	0	0	0		
2007-2012	03	V 53512 58408	0	0	0		

2007-2012	04	V 53531 58381	0	0	0
2007-2012	05	V 53577 58376	0	0	0
2007-2012	06	V 53509 58401	0	0	0

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Density	At least 2 samples on the Transect should have >5 V. angustior individuals	1 sample with >5 V. angustior individuals	Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in at least 3 places on the transect with optimal or sub-optimal habitat (minimum 5 samples)	Present in 1 of 5 places sampled	Fail
2007-2012	1	Density	At least 2 samples on the Transect should have >5 V. angustior individuals	3 samples with >5 individuals	Pass
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in at least 3 places on the transect with optimal or sub-optimal habitat (minimum 5 samples)	Present in all 5	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	At least two positive samples (with adult or sub-adult snails) from a minimum of six samples taken from across the site	Adult or sub-adult snails present in 3 spot samples (from 6 samples)	Pass

Mon. period	Population Notes
2013-2018	In the monitoring period 2007-2012, Vertigo angustior was recorded in five out of 11 locations across the site (taken both inside and outside the original polygon area), with the five positive samples all located on the transect taken in fixed dune habitat close to the Natterjack toad ponds. In the current survey, the species was recorded in four out of 11 locations, with only one positive sample on the transect and three positive samples outside the original polygon. In contrast to Moorkens & Killeen (2011), abundances were relatively high in the positive samples in 2015. Based on the current criteria, proposed by Moorkens & Killeen (2011), the Population Assessment would be Unfavourable Bad (red). However, their criteria take no account of samples off the transect, and so an additional criterion has been added. This means that the assessment is Unfavourable Inadequate (amber).
2007-2012	the abundance of the snail is relatively low

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	20m of habitat along the Transect is classed as Optimal or Sub-Optimal	21m is Suboptimal or Optimal-Suboptimal habitat	Pass
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 20m along the Transect	<20 m is Optimal wetness	Fail
2007-2012	1	Habitat extent	20m of habitat along the Transect is classed as Optimal or Sub-Optimal	21m is Optimal habitat	Pass
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 20m along the Transect	21m is optimal	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	Over 1.5ha of the site sub-optimal with optimal areas	7.7ha Suboptimal with Optimal areas	Pass
2007-2012	Habitat extent	Over 1.5 ha of the site sub-optimal with optimal areas	1.94 ha	Pass

Mon. period	Habitat Notes
2013-2018	The boundary of the polygon at Derrynane was redrawn to reflect the wider distribution of suitable habitat at this site and also to conform better to identifiable boundary features, leading to a 300% increase in polygon area (from 1.95ha to 7.69ha). The suitability of the habitat in Derrynane for supporting Vertigo angustior remains Suboptimal overall, however. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Derrynane is Unfavourable Inadequate (amber).
2007-2012	the area of occupancy and habitat of Vertigo angustior is small but in relatively good condition

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	80%	Approximately 10 cattle in winter over most of the site, but no access to dune at southwest
2013-2018	D01.01	paths, tracks, cycling tracks	Inside	High	Negative	3%	Walking tracks
2013-2018	G01.02	walking, horseriding and non-motorised vehicles	Inside	Low	Negative	1%	Horse riding (appears low impact/low intensity)
2007-2012	K02.01	species composition change	Inside	Medium	Neutral	1.9ha	

Mon. period	Future Prospects Notes
2013-2018	The Future Prospects for Derrynane were considered Favourable (green) in the monitoring period 2007-2012. The main activity noted at this site that may impact on its suitability for Vertigo angustior is non-intensive cattle grazing across most of the site (80%). While the grazing is at non-intensive levels, and is for conservation reasons, it appears to be at too high a level for Vertigo angustior at the site. The vegetation is cropped very low, and grasses achieve only a very low cover. There is no thatch build up, a feature necessary for Vertigo angustior. Other more localised impacts are walking tracks and horse riding. Based on the current level of grazing, the Future Prospects are considered Unfavourable Inadequate (amber).
2007-2012	As the impact is neutral at present, Future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Amber	Amber	Amber	Amber
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2013-2018	While the area of habitat considered suitable has been expanded and Vertigo angustior was found in a number of locations across the site, the drop in the number of positive samples along the transect, the habitat conditions and also the slight over-grazing noted all result in an Overall Assessment for Derrynane of Unfavourable Inadequate (amber).
2007-2012	

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the fixed dune habitat across the peninsula. Access is from the National Historic Park car park across the dunes.

Discussion:

The area mapped as having potential habitat for Vertigo angustior at Derrynane was expanded significantly. The species was found in two sample locations relatively distant from what had originally been understood to be its core area. Overall however, this site needs some changes in management to continue to provide suitable habitat for the species. This involves immediately relaxing the grazing regime across much of the area to allow the growth of grasses (particularly Ammophila arenaria and Festuca rubra) and also to allow the build-up of Festuca rubra thatch in places. In contrast, at the south-western end, grazers may need to be introduced as Ammophila arenaria is quite rank there.

Monitoring recommendations:

Given the management issues relating to the habitat of Vertigo angustior, it is recommended that monitoring is carried out at a minimum of three-yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Monitoring should follow that of Moorkens & Killeen (2011):

- Repeat Transect 1, describe the plant community/habitats at each sample location zones, and assign the habitat and wetness at each as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too Wet, Optimal Wetness and Too Dry, respectively
- Take 1 sample each from at least 5 locations with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations within the polygon of potentially suitable habitat (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygon and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

The site at Derrynane is currently being managed for the flora of the fixed dune habitat through winter grazing by 10 cattle (though cattle are excluded from the southwestern section, which has led this area to be dominated by Ammophila arenaria tussocks). The current level of grazing is slightly too high across most of the site resulting in a lack of suitable Festuca rubra thatch developing to support Vertigo angustior. Overall, the level of grazing (in terms of period or number of cattle) should be reduced to allow areas of Ammophila arenaria and Festuca rubra to develop where grazing is too high, while grazing should be introduced to the southwestern section to reduce the rankness of the Ammophila arenaria cover there. The management of the site is undertaken by the OPW as part of the Derrynane House National Historic Park and they may facilitate the necessary change in cattle grazing.

Vertigo angustior monitoring at Derrynane

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the fixed dune habitat with high groundwater levels close to the ponds used for Natterjack toads. Access is from the national park car park across the dunes.

Discussion:

Although the transect is shorter than at many Vertigo angustior sites and only comprises one main habitat/vegetation type, the purpose of the transect is to ensure there is suitable V. angustior habitat within the zone between the marram dominated dune above the transition and the pond below the transition. The transition should retain a 2 metre wide zone dominated by Festuca rubra, and containing Lotus corniculatus, Plantago lanceolata, Trifolium repens, Galium verum, Viola tricolour, Lotus corniculatus. The habitat should retain a damp litter layer with some moss presence.

Insufficient sampling was carried out in 2006 to permit a retrospective Condition Assessment to be carried out. However, whilst the habitat along the transect remains unchanged from 2006, higher numbers of Vertigo angustior individuals were recorded in 2008. However, despite the apparent suitability of much of the adjacent dune grassland, the snail was not found and is thus, still restricted to this single dune face.

Due to the importance of this site for Vertigo angustior, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the short to medium term. This site should also form part of a suite of important flora and fauna sites for long term surveillance studies in anticipation of potential effects of climate change. For example, a pattern of long dry summers followed by stormy wet winters may mean that the conditions for V. angustior may become less favourable.

In the past a larger area of the site may have been occupied by the snail, but historical sheep and/or rabbit grazing may have restricted it to the groundwater dependant area where it is now confined.

Monitoring recommendations:

Given the small area of occupancy and habitat of Vertigo angustior, and the relatively low abundance of the snail, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2011
Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 1, describe the plant community/habitats at each sample location zones, and assign the habitat and wetness at each as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 5 locations with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations within the polygon of potentially suitable habitat (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygon and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

The V. angustior habitat is not managed by grazing or mowing and is essentially managed by wind, trampling by visitors and hydrogeology.

Proposed management prescription for Vertigo angustior

The management at Derrynane should remain the same as the present, i.e. no grazing management with succession being prevented by the elements rather than active intervention. As with all low management regimes, this needs careful monitoring, particularly as weather patterns may change and occasional intervention such as strimming may be needed in the future.

The area between the dune and the pond should not be mowed or fertilized. Sheep grazing should not be allowed. No deepening or other changes to the pond should be undertaken. The area between the dune and the pond should not be part of any formal or informal walking route, but neither should it be fenced off. Irregular trampling is beneficial to the species, but compaction would have a negative affect on the habitat quality.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Dooaghtry

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM03 **County:** Mayo

SAC Site Code: 001932 Mweelrea/Sheeffry/Erriff Complex

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	9-10 June 2014	John Brophy & Maria Long
2007-2012	5-7 August 2008	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitats in which Vertigo angustior is present are unimproved climax maritime grassland, humid tall herb communities (Iris) (CORINE 37.21) and the ecotone between marsh/riparian zone and maritime grassland (Devillers et al., 1991). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of this unshaded habitat. The dominant vegetation is Festuca rubra, with Potentilla anserina and Iris
pseudacorus, corresponding to M27 of Rodwell (1991). The habitat falls between the more general habitats of wet grassland (GS4) and marsh (GM1) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Maritime grassland with Festuca rubra and Potentilla anserina, 10-25cm in height OR damp grassland dominated by Iris pseudacorus, Potentilla anserina and other grasses up to 0.9m high. Habitats growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but maritime grassland vegetation height is less than 5cm or greater than 15cm, or the Iris grassland is >0.9m high, or the water table is below 5cm or ground is flooded at the time of sampling.
Unsuitable	Not defined

2. SUMMARY:

The assessment of this site has changed from green in 2007-2012 to amber 2013-2018. This is because of a change in land management (from cattle to sheep). This is a small site, with a small core area supporting the target species. This means that the species is vulnerable, but it also means that instigating changes in land management and subsequent monitoring are achievable. Contact needs to be made immediately with the land-owner and negotiations into changing land management begun. This site needs to be monitored carefully over the coming years.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	L 74434 70520	Start point at edge of channel.	
End point:	L 74478 70521	Ditch filled with sedge Carex acutiformis	
Transect length:	45	**Direction:**	As for 2007-2012
Description:	As for 2007-2012		
Sampling frequency:	As for 2007-2012		

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	L 74434 70525	Stream edge	
End point:	L 74475 70521	Ditch	
Transect length:	44.5	**Direction:**	West to east
Description:	The transect covers a transition from Festuca rubra dominated maritime grassland, to damp Iris/Festuca rubra/Potentilla anserina grassland/ marsh. Transect runs towards the south side of a white gable end of a farm.		
Sampling frequency:	Four samples were taken from 3 of the delineated zones along the transect.		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	0.2576	Polygon A status remains Optimal. This is a small polygon containing maritime wet grassland.

Vertigo angustior monitoring at Dooaghtry

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
B	Optimal-Suboptimal	0.7512	Polygon B status was upgraded from Sub-optimal to Optimal-Suboptimal due to some redrawing of the boundary. The SE portion of E merged into Polygon B as is same management unit. The habitat is maritime grassland.
D	Suboptimal-Unsuitable	1.8971	Polygon D status was upgraded from Unsuitable to Suboptimal-Unsuitable as some potenitally suitable habitat present. Area around shed and cattle crush removed as unsuitable.
E	Suboptimal-Unsuitable	3.5913	Polygon E status was upgraded from Unsuitable to Suboptimal-Unsuitable, as the boundary was amended at NE to include area within same fenced management unit. Also, vegetation similar. SW area removed as too sandy with short vegetation and separated by fence. SE area merged with Polygon B, as is same management unit. Polygon C appears to have been merged with E by Moorkens & Killeen, 2011.
F	Unsuitable	2.9155	Polygon F status remains Unsuitable. Slurry-spreading, very short sward

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	0.234	Polygon A
B	Sub-optimal	0.439	Polygon B
C	Unsuitable	0.366	Polygon C - V heavily grazed
D	Unsuitable	2.042	Polygon D very heavily grazed
E	Unsuitable	2.632	Polygon E very heavily grazed
F	Unsuitable	2.916	Polygon F very heavily grazed

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	2.3m	38.2m	2m		2.5m	43 m		2m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	8.5m	NA	34.5	NA	2m	42.5m	2	

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 Transect 1 (5 samples)							
2013-2018	1	1	2 m	0	0	0	Optimal-Suboptimal
2013-2018	1	2	4 m	3	0	3	Optimal
2013-2018	1	3	10 m	3	0	3	Optimal
2013-2018	1	4	20 m	1	0	1	Optimal-Suboptimal
2013-2018	1	5	28 m	1	0	1	Optimal-Suboptimal
Monitoring period 2007-2012 Transect 1 (4 samples)							
2007-2012	1	1	5m	0	0	6	
2007-2012	1	2	11m	0	0	19	
2007-2012	1	3	28m	0	0	11	
2007-2012	1	4	38m	0	0	2	

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 (4 samples)						
2013-2018	01	L 74452 70698	0	0	0	Suboptimal-Unsuitable
2013-2018	02	L 74460 70566	0	0	0	Suboptimal
2013-2018	03	L 74422 70576	5	0	5	Optimal-Suboptimal

2013-2018	04	L 74417 70560	0	0	0	Suboptimal

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 1 of the 3 maritime grassland zones (0-8.5m) and in the 2 Iris grassland zones (8.5-28.3m, and 28.3-42.5m)	Present in all three zones	Pass
2013-2018	1	Species extent	Adult or sub-adult snails present in at least 1 out of 4 samples taken from across the site.	Present in 1 sample	Pass
2007-2012	1	Density	At least 2 samples on the Transect should have >6 V. angustior individuals	3 samples with 6 or more	Pass
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 1 of the 3 maritime grassland zones (0-8.5m) and in the 2 Iris grassland zones (8.5-28.3m, and 28.3-42.5m)	Present in all 3 zones (plus one other)	Pass

Mon. period	Population Notes
2013-2018	Vertigo angustior was recorded in low numbers in four of five samples taken on the transect and one other spot sample (in Polygon B). This is similar to the previous sampling period, which found the snails in four of four samples (all taken on the transect). The assessment criteria of Moorkens & Killeen (2011), which looked at numbes of snails per sample on the transect was replaced by one based on presence/absence across the site. Based on the revised criteria, the Population Assessment is Favourable (green).
2007-2012	the snail is moderately common

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	40m of habitat along the Transect is classed as suitable (Optimal or Sub-optimal habitat)	43m of habitat along the Transect is classed as suitable (Optimal or Sub-optimal habitat)	Pass
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 40m along the Transect	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 43 m along the Transect	Pass
2007-2012	1	Habitat extent	40m of habitat along the Transect is classed as suitable (Optimal or Sub-optimal habitat)	42.5m	Pass
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 40m along the Transect	42.5m optimal	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	>0.2ha of the site classed as optimal and a further 0.4-0.6ha sub-optimal	0.26ha Optimal and 0.75 ha Optimal-Suboptimal	Pass
2007-2012	Habitat extent	>0.2 ha of the site classed as optimal and a further 0.4-0.6ha sub-optimal	0.26 ha optimal and 0.53 ha sub-optimal	Pass

Mon. period	Habitat Notes
2013-2018	The core area of habitat for Vertigo angustior at Dooaghtry (Polygon A) remains Optimal. While apparent slight upgrades have been made to the classification of polygons B, D and E, these are due in part to the use of a 5-point scale rather than

2013-2018	a 3-point scale and some changes to the boundaries. However, Polygon E in particular was felt to have better potential for the species than previous assessments suggested. Polygon F remains Unsuitable, with polygons D and E being Suboptimal-Unsuitable. Thus, only Polygon B provides additional substantial areas of potentially optimal habitat.
2007-2012	the area of occupancy and habitat of Vertigo angustior is small but in good condition

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.02.02	non intensive sheep grazing	Inside	Medium	Negative	100%	
2013-2018	K01.01	Erosion	Inside	Low	Negative	1%	
2013-2018	K01.04	Submersion	Inside	Medium	Negative	100%	Winter storms
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Medium	Positive	0.67ha	As the grazing by cattle appears to be maintaining vegetation levels well without excessive trampling damage, its impact is positive.

Mon. period	Future Prospects Notes
2013-2018	The Future Prospects for Vertigo angustior at Dooaghtry were considered to be Favourable (green) by Moorkens & Killeen (2011), as the only activity identified was a positive influence from cattle grazing, which maintained the vegetation without excessive trampling damage. In the current study, it was found that sheep are now grazing the site and this is having a moderate negative effect by producing a tight sward in places, unsuitable for V. angustior. Sheep grazing was identified by Moorkens & Killeen (2011) as one activity that should certainly not be undertaken at the site. While the habitat in the core area for Vertigo angustior remains Optimal, this may change in the future if sheep grazing continues. Winter sea flooding has occurred at the site in recent years and an increase in the frequency of such flood events may result in the loss of Vertigo angustior from the site. For these reasons, the Future Prospects of Vertigo angustior at Dooaghtry are assessed as Unfavourable Inadequate (amber).
2007-2012	the impact of cattle grazing impact is positive. Future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Green	Green	Amber	Amber
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2013-2018	While the habitat for Vertigo angustior in Polygon A, the core of the suitable habitat, continues to be Optimal, with other suitable areas found, along with a positive record for the species in Polygon B, the change in management from grazing by cattle to grazing by sheep poses a serious threat to the species in the longer term.
2007-2012	

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: As in 2007-2012, the habitat that supports Vertigo angustior within this cSAC is the grassland and Iris along the rivers edge to the north east of the road entrance to Dooaghtry. Access is from the road to the beach, near the car park.

Discussion:

The assessment of this site has changed from green in 2007-2012 to amber 2013-2018. This is because of a change in land management (from cattle to sheep). This is a small site, with a small core area supporting the target species. This means that the species is vulnerable, but it also means that instigating changes in land management and subsequent monitoring are achievable. Contact needs to be made immediately with the land-owner and negotiations into changing land management begun. This site needs to be monitored carefully over the coming years.

Monitoring recommendations:

In light of the sheep grazing, which is causing negative habitat impacts, monitoring should be carried out at three-yearly intervals for

the target species. More frequent visits will be needed for landowner liaison and habitat condition monitoring. Monitoring largely to follow that of Moorkens & Killeen (2011), with the addition of some spot sampling:

Assessment of the transect and other locations with spot sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable, and Too dry, Optimal wetness or Too wet, respectively
- Take 2 samples from the maritime grassland zones (0-8.5m) on the transect and analyse for molluscan composition
- Take 3 samples from the Iris marsh zones (8.5m-42.5m) on the transect and analyse for molluscan composition
- Assign polygon habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Take 4 spot samples in the most suitable habitat areas from across the site outside Polygon A.
- Use results to determine overall condition assessment

Management recommendations:

When Moorkens & Killeen (2011) carried out their assessment based on the 2008 survey, it was determined that the low level of grazing by cattle was ideal for maintaining the habitat for Vertigo angustior at the site and that sheep should not be allowed to graze the area. As noted, sheep now appear to be the sole grazers of the site and this will lead to negative impacts on the Vertigo angustior habitat. In light of this, attempts should be made remove sheep from the site and return it to cattle grazing at a low level. Moorkens & Killeen (2011) recommended a level of no more than 0.6 livestock units per hectare and to be removed at the first sign of damage or if additional feeding is required. This should be the starting point of any future management, with on-going habitat monitoring to ensure no significant negative effects from the grazing. The large sedge Carex acutiformis was recorded in a large stand in Polygon D and, as it does not provide suitable habitat for Vertigo angustior, any spread of this species should be monitored and managed. No fertiliser should be applied to the site.

Vertigo angustior monitoring at Dooaghtry

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the grassland and Iris along the rivers edge to the north east of the road entrance to Dooaghtry. Access is from the road to the beach, near the car park.

Discussion:

The Condition of the site and the feature based upon the 2008 survey has been assessed as Favourable. The results obtained in 2008 are very similar to those from 2006 (Appendix 2, and Figure 1) with the vegetation and wetness levels virtually unchanged. There was some evidence of trampling in the Iris grassland. Vertigo angustior was found at each sample location and was present in either low or moderate numbers.

Monitoring recommendations:

The Condition of the site, both in terms of habitat and Vertigo angustior distribution and abundance is Favourable, and, therefore, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2011
Methods (see Section 3 of main report for full details) Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from the 3 maritime grassland zones (0-8.5m) with the most suitable habitat on the transect and analyse for molluscan composition
- Take at least 1 sample each from the 2 Iris marsh zones (8.5m-42.5m) with the most suitable habitat on the transect and analyse for molluscan composition
- Re-determine boundary of the habitat polygons A and D and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Additional surveillance at 6 yearly intervals:

Frequency: Next monitoring due 2014
Methods (see Section 3 of main report for full details). Prescription as follows:
- Describe habitat and take 5 samples from the most suitable habitat in Polygon area D and analyse for molluscan composition

Management recommendations:

Existing Management

The V. angustior habitat has one management unit. Within this unit very light grazing by cattle was evident and these animals extensively roam over a wide area. This practice has resulted in excellent open vegetation, with a good build up of well thatched litter, resulting in a molluscan fauna of open ground, which are not suffering from competition from shade loving species. The field across the road was more heavily grazed, but also naturally drier in nature and not a suitable conservation area for this species.

Proposed management prescription for site

The management at Dooaghtry should remain the same as the present regime for the 2011-2014 period. The area should be grazed by up to six cattle or no more than 0.6 livestock units per hectare. The cattle grazing should be periodic and dependent upon the capacity of the site during the weather conditions of any particular year. The animals should be removed at the first sign of damage to the habitat or hunger. There should be no lowering or intensifying of this regime. There should be no supplementary feeding of animals within the Vertigo angustior habitat. There should be no improvement with fertiliser or drainage of any of the habitat area. Under no circumstances should sheep be allowed to graze this area.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Glencolmcille

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM04 **County:** Donegal

SAC Site Code: 000190 Slieve Tooey/Tormore Island/Loughros Beg Bay

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	19-20 August 2014	John Brophy & Maria Long
2007-2012	5 August 2008	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). There is also some potential habitat within the ecotone between the fixed dunes and the river valley below, in wet Iris flood plain but this was not suitable habitat during the time of the survey. The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is Festuca rubra, with some Ammophila arenaria higher up, corresponding to SD7 of Rodwell (2000), and Lotus corniculatus, Thymus praecox, Plantago lanceolata, Anthyllis vulnereria, Trifolium repens, Galium verum, Viola tricolour and Euphrasia lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra, with sparse Ammophila arenaria, Lotus corniculatus, Thymus praecox, Plantago lanceolata, Anthyllis vulnereria, Trifolium repens, Galium verum and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter, or the thatch has either a very dense structure, or the thatch is very sparse.
Unsuitable	Unfixed dune habitat, dominated by Ammophila arenaria and Tussilago farfara, very little thatch, or tall rank vegetation (>0.5m high) with Cirsium spp., umbellifers, tall grass species, thatch rather dense and wet.

2. SUMMARY:

Vertigo angustior has not been recorded at this site since 2006, in spite of dedicated surveys. The sites sees significant human use – e.g. sports grounds (now excluded), arable plots, grazing, walkers. These activities occur piecemeal across the site, making management particularly challenging. Vertigo angustior may still occur at this site in low numbers and immediate changes in management are needed to increase the area of potentially suitable habitat for the species. Contact should be made immediately with local landowners to begin this process.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	G 52747 85011	A fencepost by the pylon in the corner of the GAA training pitch	
End point:	G 52630 85097	N facing lower dune slope. End near-vertical drop to beach; More mobile. Bare sand visible.	
Transect length:	153	**Direction:**	As for 2007-2012
Description:	As for 2007-2012		
Sampling frequency:	As for 2007-2012		

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	G 52749 85010	A fencepost by the pylon in the corner of the GAA pitch	
End point:	G 52638 85107	The estuary shore at the base of the fore dune	
Transect length:	153	**Direction:**	SE to NW
Description:	The transect runs across undulating Festuca rubra dominated fixed dune grassland, up the slope towards the unfixed dune edge and down to the eroding foreshore. The transect runs towards a small, isolated sycamore near the dune crest.		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Six samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition		

4. RESULTS

Vertigo angustior monitoring at Glencolmcille

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	7.7751	Polygon A status remains Suboptimal. The boundary has been altered to include area to north (formerly part of Polygon B), as some potentially suitable habitat and transect runs into this area.
B	Unsuitable	8.4331	Polygon B status remains Unsuitable. Area at NE removed as now football pitches, car park and clubhouse. Section at N merged with Polygon A (see above)

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal	7.16	Polygon A
B	Unsuitable	12.24	Polygon B

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		6 m	11m	36m	42m	128m		25m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	14m	NA	61m	NA	78m	120m		33m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 Transect 1 (6 samples)							
2013-2018	1	1	47 m	0	0	0	Optimal-Suboptimal
2013-2018	1	2	59 m	0	0	0	Optimal
2013-2018	1	3	65.5 m	0	0	0	Optimal-Suboptimal
2013-2018	1	4	79 m	0	0	0	Optimal-Suboptimal
2013-2018	1	5	99 m	0	0	0	Optimal-Suboptimal
2013-2018	1	6	111 m	0	0	0	Suboptimal-Unsuitable
Monitoring period 2007-2012 Transect 1 (6 samples)							
2007-2012	1	1	40m	0	0	0	
2007-2012	1	2	60m	0	0	0	
2007-2012	1	3	89m	0	0	0	
2007-2012	1	4	92m	0	0	0	
2007-2012	1	5	103m	0	0	0	
2007-2012	1	6	115m	0	0	0	

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 (6 samples)						
2013-2018	01	G 52624 85060	0	0	0	Suboptimal-Unsuitable
2013-2018	02	G 52541 85072	0	0	0	Optimal-Suboptimal
2013-2018	03	G 52403 85060	0	0	0	Optimal-Suboptimal
2013-2018	04	G 52403 84875	0	0	0	Optimal-Suboptimal
2013-2018	05	G 52570 84900	0	0	0	Optimal-Suboptimal
2013-2018	06	G 52690 84877	0	0	0	Suboptimal
Monitoring period 2007-2012 (3 samples)						

2007-2012	01	G 52623 85052	0	0	0
2007-2012	02	G 52585 85024	0	0	0
2007-2012	03	G 52541 85031	0	0	0

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 2 of the grassland zones (0-104m) with habitat Suboptimal or better (minimum 6 samples)	Adult or sub-adult snails are Absent from Transect (6 samples)	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 2 of the grassland zones (0-104m) with optimal or sub-optimal habitat (minimum 6 samples)	Absent in all samples	Fail

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in at least one other location on the site (minimum 6 samples)	Adult or sub-adult snails are absent from the site (from 6 samples)	Fail
2007-2012	Presence/Absence	Adult or sub-adult snails are present in at least one other location on the site (minimum 6 samples)	Absent elsewhere in 2008	Fail

Mon. period	Population Notes
2013-2018	Vertigo angustior was not found anywhere at this site in 2014. Given that it was not found in the 2008 survey, it must be presumed that the population is either currently very small, or has disappeared from the site.
2007-2012	the snail could not be found anywhere on the site

5.2 Habitat Assessment: 3 passes Favourable (green); 1-2 passes Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	90m of habitat along the Transect is classed as Suboptimal or better	75m of habitat along the Transect is classed as Suboptimal or better	Fail
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (Optimal wetness) and covered with a layer of humid thatch for 90m along the Transect	Soils, at time of sampling, are damp (Optimal wetness) and covered with a layer of humid thatch for 128m along the Transect	Pass
2007-2012	1	Habitat extent	90m of habitat along the Transect is classed as Optimal or Sub-Optimal	75m is Optimal or Sub-Optimal	Fail
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 90m along the Transect	120m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	At least 6.5ha of the site sub-optimal with optimal areas	7.78ha Sub-optimal	Pass
2007-2012	Habitat extent	At least 6.5 (ha) of the site sub-optimal with optimal areas	7.16 ha	Pass

Mon. period	Habitat Notes
2013-2018	Habitat suitability classifications for polygons A and B have not changed since 2007-2012, though boundaries have been altered to remove a large area that is now sports grounds. The area of suitable habitat for Vertigo angustior at this site is limited.

2007-2012	The habitat at the site is not in good condition for V. angustior

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A01	Cultivation	Inside	High	Negative	20%	Potato plots
2013-2018	A03.01	intensive mowing or intensification	Inside	High	Negative	10%	Some fields to south. Hay/silage
2013-2018	A04.02.05	non intensive mixed animal grazing	Inside	Medium	Negative	25%	Sections of dune to west grazed heavily and some fields to south.
2013-2018	A04.03	abandonment of pastoral systems, lack of grazing	Inside	Medium	Negative	25%	Potentially most suitable areas rank.
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	7ha	Although there is grazing present, the grazing may be too low to maintain ideal vegetation height. In addition, in recent years sheep appear to have been introduced to the site for winter grazing as well as summer cattle grazing. The combination and timing of grazing may be the key to the problems at the site.
2007-2012	A04.02.02	non intensive sheep grazing	Inside	Medium	Negative	7ha	
2007-2012	A04.03	abandonment of pastoral systems, lack of grazing	Inside	Medium	Negative	7ha	

Mon. period	Future Prospects Notes
2013-2018	The Future Prospects for Glencolmcille, as assigned by Moorkens & Killeen (2011) following the 2008 survey, were Unfavourable Inadequate (amber), due to the negative impact on Vertigo angustior habitat from mixed grazing of cattle and sheep. The current survey identified mixed animal grazing, cultivation of potatoes and lack of grazing in places as having a negative impact on the suitability of the site for Vertigo angustior. The target species was last recorded at the site in 2006 and was not recorded in 2008 (Moorkens & Killeen, 2011) or 2014 (current study). Therefore, the Future Prospects of this site have been classified as Unfavourable Bad (red).
2007-2012	As the impact is not fully understood to date, Future prospects have been assessed as Unfavourable inadequate

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Red	Amber	Red	Red
2007-2012	Red	Amber	Amber	Red

Mon. period	Overall Notes
2013-2018	In light of the fact that V. angustior has not been recorded at this site since 2006 and the existing state of the site under its very mixed management regime, the overall assessment of Glencolmcille is considered Unfavourable Bad (red).
2007-2012	

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: The habitat that supported Vertigo angustior within this cSAC was the fixed dune habitat to the south of the Murlin River Estuary. Access is from the car park on the R263 at Glencolmcille. The species has not been found in surveys in 2008 and 2014 so the current area of occupancy is unknown. The species may still exist at the site

in small numbers, or may have been lost.

Discussion:

Vertigo angustior has not been recorded at this site since 2006, in spite of dedicated surveys. The site sees significant human use - e.g. sports grounds (now excluded), arable plots, grazing and walkers. These activities occur piecemeal across the site, making management particularly challenging. Vertigo angustior may still occur at this site in low numbers and immediate changes in management are needed to increase the area of potentially suitable habitat for the species. Contact should be made immediately with local landowners to begin this process.

Monitoring recommendations:

This site needs management intervention if it is to have any chance of supporting a population of Vertigo angustior. Once this has been instigated, monitoring should be at three-yearly intervals until such time as the population has recovered and is deemed stable. Monitoring should follow that of Moorkens & Killeen (2011):

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable, and Too dry, Optimal wetness or Too dry, respectively
- Take at least 1 sample each from at least 6 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of at least 6 other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

Future management of the site at Glencolmcille should include the removal of sheep grazing from the site entirely and a return to an appropriate level of cattle grazing to prevent the vegetation becoming rank, while allowing a good Festuca rubra thatch to develop. Ideally, no additional agricultural activities should be carried on at the site (e.g. potato cultivation), and those potato plots that have been abandoned should be opened up for grazing. For levels and type of cattle grazing, refer to Moorkens & Killeen (2011) (see below)

Vertigo angustior monitoring at Glencolmcille

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the fixed dune habitat to the south of the Murlin River Estuary. Access is from the car park on the R263 at Glencolmcille.

Discussion:

The Condition of the site and the feature based upon the 2008 survey has been assessed as Unfavourable due to the decline in the condition of the habitat within the main polygon, and the absence of Vertigo angustior both on the transect and at other locations.

Based upon changes observed since the corrected discovery in 2000 and since the last survey in 2006, it appears that there is a decline in habitat quality, along with a contraction in the distribution and abundance of Vertigo angustior, such that in 2008 the snail was not found in any of the samples despite that there are areas within the central part of the site, including the transect line which support apparently optimal habitat. Comparison of the transects between 2006 (Appendix 1) and 2008 shows a significant reduction in the proportion of optimal and sub-optimal habitat from 122m to 75m. At the start of the transect the vegetation has become taller and ranker, whereas the habitat towards the end of the transect has become less fixed. It is likely that the decline, particularly in habitat quality, results from changes in management. However, whilst populations of V. angustior are known to fluctuate in abundance and small-scale distribution, the recent pattern of long wet summers followed by stormy wet winters may mean that the conditions for V. angustior are becoming less favourable.

In general, Vertigo angustior is not found on sites that have combined cattle and sheep grazing. In fact, Vertigo angustior rarely survives sheep grazing for any period. Sheep graze uniformly at the moss/root level that is the micro-habitat that the snail needs. The combination of low levels of cattle grazing followed by cropping by sheep gives the impression of an undergrazed landscape (which it is for part of the year) but the main damage may be done during overgrazing or unsuitable grazing by sheep in winter.

Future prospects have been assessed as Unfavourable inadequate (amber). However, a repeat of the transect and spot sampling should be undertaken again as soon as possible, in order to assess whether the snail has recovered.

Monitoring recommendations:

Given the evidence for an overall deterioration of the site both in terms of population and habitat for Vertigo angustior, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals.

Frequency: Next monitoring due 2011
Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take at least 1 sample each from at least 6 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of at least 6 other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

There are two distinct management units at the Glencolmcille site which comprise the 2 habitat polygons. Area A consists of the outer and lower dune habitat, with scrub in places and arable practices in others (potatoes). Most of this is not habitat for the snail, except for small patches of Festuca grassland in knolls, where the habitat is maintained by exposure. The best of the habitat is within Polygon B. This area is lightly grazed by cattle for periods of the Spring and Autumn. The local farmer told us that sheep are grazed in winter only, and this is likely to be having a negative effect.

Proposed management prescription for site

Habitat polygon B should remain grazed by cattle with no more than 0.8 livestock units per hectare, and grazing periods should typically be in the spring to autumn periods, with animals removed for the winter. Livestock should be young suckler or mixed age cattle. There should be no lowering or intensifying of this regime. There should be no supplementary feeding of animals within the Vertigo angustior habitat, with animals removed at the first signs of hunger. There should be no improvement with fertiliser or drainage of any of the habitat area. The landowner should be encouraged not to graze sheep on this site at any time of the year.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Kilshannig

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM05 **County:** Kerry

SAC Site Code: 002070 Tralee Bay and Magharees Peninsula, West to Cloghane

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	26-30 May 2014	John Brophy & Maria Long
2007-2012	29 July 2008	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present is low, undulating fixed grey dunes and machair (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The microhabitat of the snail is the living and decaying vegetation and moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is Festuca rubra, with some Ammophila arenaria, corresponding to SD7 of Rodwell (2000), and Lotus corniculatus, Pilosella officinarum, Trifolium repens, Galium verum, and Euphrasia lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra, with sparse Ammophila arenaria, Geum verum, Euphrasia sp. Pilosella officinarum, Thymus polytrichus, Anthyllis vulneraria and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure, or low willow scrub covers more than 10% of the habitat.
Unsuitable	Not defined

2. SUMMARY:

This site has considerable habitat which has good potential for Vertigo angustior. In their 2011 report, Moorkens & Killeen stated that it was being grazed by cattle, and at an optimal level to provide habitat for the snail. In 2014, much of the habitat was grazed too tightly – there was little Festuca thatch or moss build-up. Consequently, there needs to be a slight relaxation in grazing at the site. However, the change needed is small, and great care must be taken when organising this with the landowner/land manager – abandonment of grazing would also quickly become detrimental to the species' habitat. There is very good scope for the species at this site, pending slight management changes.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point: Q 61600 17319 Fence post on mound

End point: Q 61571 17243 Low mound

Transect length: 82 **Direction:** N-S

Description: As for 2007-2012

Sampling frequency: As for 2007-2012

TRANSECT: 2 **MONITORING PERIOD:** 2013-2018

Start point: Transect 2 not done. Replaced by spot samples.

End point:

Transect length: **Direction:**

Description:

Sampling frequency:

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	Q 61596 17319	Fence post on top of a mound (field boundary)	
End point:	Q 61570 17244	Low mound with dense willow	
Transect length:	83	**Direction:**	N-S
Description:	The transect runs across gently undulating fixed dune grassland with a diversity of low growing herbs. The habitat along the transect is grazed by cattle and is rarely more than 20cm in height. Runs in direct line to a telegraph pole at Q61484 16969		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Seven samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition		

TRANSECT: 2 **MONITORING PERIOD:** 2007-2012

Start point:	Q 61570 17244	End point of Transect 1 -low mound with dense willow	
End point:	Q 61484 16969	Gate by road	
Transect length:	288	**Direction:**	N-S
Description:	The transect runs across gently undulating fixed dune grassland with a diversity of low growing herbs. The habitat along the transect is grazed by cattle and is rarely more than 20cm in height.		
Sampling frequency:	A single sample was taken at 170m distance from the start point		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	24.7198	Polygon A status remains Optimal-Suboptimal. The habitat is grazed fixed dune with dune slack. (Note: Area difference from 2007-2012 appears to be due to original miscalculation)
B	Suboptimal	13.8338	Polygon B status is raised from Sub-optimal and Unsuitable to Suboptimal, as the polygon includes good areas of suitable fixed dune habitat, which is grazed.
C	Suboptimal-Unsuitable	7.3238	Polygon C status remains Suboptimal-Unsuitable. The habitat is grazed fixed dune, but is heavily grazed. The southern boundary has been altered to remove the caravan park from the polygon.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal with optimal areas	24.23	Polygon A - Mostly fixed dune habitat and machair.
B	Sub-optimal with unsuitable areas	14.62	Polygon B - Dunes less fixed and with higher level of cattle grazing. Area also includes a small dune slack.
C	Sub-optimal with unsuitable areas	7.21	Polygon C - Mostly unfixed dunes near the road.

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1			69.5m		12.5m	12.5m		69.5m
2	Transect 2 not done. Replaced by spot samples							

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	43.5m	NA	39.5m	NA		83m		
2		NA	288m is sub-optimal with some optimal patches	NA				

Transect samples

Vertigo angustior monitoring at Kilshannig

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 Transect 1 (6 samples)								
2013-2018	1	1	Q 61600 17317	0	0	0		Suboptimal
2013-2018	1	2	Q 61590 17297	1	0	1	Presence/Absence	Suboptimal
2013-2018	1	3	Q 61588 17289	0	0	0		Suboptimal
2013-2018	1	4	Q 61587 17273	0	0	0		Suboptimal
2013-2018	1	5	Q 61580 17261	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	1	6	Q 61575 17253	0	0	0		Suboptimal
Monitoring period 2007-2012 Transect 1 (7 samples)								
2007-2012	1	1	4m	0	0	3		
2007-2012	1	2	22m	0	0	0		
2007-2012	1	3	31m	0	0	4		
2007-2012	1	4	45m	0	0	0		
2007-2012	1	5	54m	0	0	0		
2007-2012	1	6	62m	0	0	18		
2007-2012	1	7	71m	0	0	4		
Monitoring period 2007-2012 Transect 2 (1 sample)								
2007-2012	2	8	250m	0	0	2		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 (8 samples)							
2013-2018	01	Q 62013 17284	1	0	1	Presence/absence	Suboptimal
2013-2018	02	Q 61954 17079	0	0	0		Optimal-Suboptimal
2013-2018	03	Q 61843 16900	0	0	0		Suboptimal
2013-2018	04	Q 61552 16552	0	0	0		Optimal
2013-2018	05	Q 61446 16596	0	0	0		Suboptimal
2013-2018	06	Q 61325 16489	0	0	0		Optimal-Suboptimal
2013-2018	07	Q 61629 16802	0	0	0		Optimal-Suboptimal
2013-2018	08	Q 61701 16722	0	0	0		Suboptimal

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in at least 3 samples (minimum 6) of samples taken on Transect 1	Adult or sub-adult snails are present in 2 of 6 samples taken on Transect 1	Fail
2013-2018	2	Presence/Absence	Adult or sub-adult snails are present in at least 1 location on Transect 2 (minimum 2 samples)	Transect 2 not sampled. Eight spot samples taken throughout the site instead	ND
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in at least 3 samples (minimum 6) of samples taken on Transect 1	Present in 4 of the 7 samples	Pass
2007-2012	2	Presence/Absence	Adult or sub-adult snails are present in at least 1 location on Transect 2 (minimum 2 samples)	Present in 1 location	Pass

Mon. period	Indicator	Target	Result	Pass/Fail

2013-2018	Presence/Absence	Adult or sub-adult snails are present in at least 2 spot samples (from a minimum of 6) taken from across the site	Adult or sub-adult snails present in 1 spot sample (from 8 spot samples)	Fail

Mon. period	Population Notes
2013-2018	Vertigo angustior was present in fewer samples along Transect 1 than in the 2007-2012 period (two of six, compared with four of seven), but was also found away from the transect at a sample location in Polygon B. A further eight spot samples were taken across the site (rather than 2 along Transect 2), and only one was positive. Based on the criteria of Moorkens & Killeen (2011) (amended to reflect the change from Transect 2 to spot sampling), the population assessment is Unfavourable Bad (red).
2007-2012	the snail is present throughout the transect in good numbers

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	40m of habitat on Transect 1 should be classed as Optimal and 80m should be Optimal and sub-optimal	0 m of habitat on Transect 1 classed as Optimal and 69.5 m as Sub-optimal	Fail
2013-2018	1	Habitat quality	Soils should be optimal wetness for 80 m of Transect 1	Soils have optimal wetness for 12.5 m of Transect 1	Fail
2013-2018	2	Habitat extent	At least 75% of the length of T2 is classed as Optimal-Suboptimal or better	Transect 2 not sampled. Eight spot samples taken throughout the site instead	ND
2007-2012	1	Habitat extent	40m of habitat on Transect 1 should be classed as Optimal and 80m should be Optimal and sub-optimal	3.5m optimal, 83m is optimal & sub-optimal	Pass
2007-2012	1	Habitat quality	Soils should be optimal wetness for 80m of Transect 1	83m optimal	Pass
2007-2012	2	Habitat extent	At least 75% of the length of T2 is classed as optimal and sub-optimal	100%	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	At least 12ha of the site sub-optimal with optimal areas	24.7ha Optimal-Suboptimal and 13.8 ha Suboptimal	Pass
2007-2012	Habitat extent	At least 12 ha of the site sub-optimal with optimal areas	24.7 ha Optimal/Sub-optimal	Pass

Mon. period	Habitat Notes
2013-2018	The habitat classification for polygons A and C remain unchanged from 2007-2012, while Polygon B is upgraded to Suboptimal. This upgrade is based on the quality of the habitat seen in 2014. Grazing has resulted in the habitat being less suitable for Vertigo angustior across much of the site, with short vegetation, little thatch and dry soils due to low vegetation cover. Based on the Moorkens & Killeen (2011) criteria, the habitat assessment is Unfavourable Bad (red).
2007-2012	The habitat at the site is in good condition for V. angustior,

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Low	Negative	95%	Cattle grazing levels are too high to allow good litter build up
2013-2018	K01.01	Erosion	Inside	High	Negative	1%	
2013-2018	K04.05	damage by herbivores (including game species)	Inside	Low	Negative	5%	Rabbits

2007-2012	A04.02.01	non intensive cattle grazing	Inside	Medium	Neutral	>43ha	The impacts are neutral, with sufficient cattle to maintain the habitat at a suitable vegetation height to suit the snail.

Mon. period	Future Prospects Notes
2013-2018	Non-intensive cattle grazing is occuring across most of the site. This appears to be somewhat in excess of what is required to allow suitable habitat for Vertigo angustior (i.e. build up of Festuca thatch and/or moss at least in some places). Optimal habitat patches are limited. Changes in grazing regime are needed. Future Prospects are therefore considered to be Unfavourable Inadequate (amber).
2007-2012	As the impacts are neutral, with sufficient cattle to maintain the habitat at a suitable vegetation height to suit the snail, future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Red	Red	Amber	Red
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2013-2018	In general, the Vertigo angustior habitat at Kilshannig is good, with large areas of Optimal-Suboptimal habitat, but at a finer scale, for example Transect 1, the habitat is not as suitable as it was in 2007-2012, showing the effects of grazing and the associated short sward. The number of positive samples on the transect was down on the previous sampling period, though the target species was also recorded away from the transect. The fact that grazing at the site is slightly too high to allow a good build-up of litter and Festuca rubra thatch has resulted Future Prospects being classified as Unfavourable Inadequate (amber). Therefore, the overall assessment is Unfavourable Bad (red).
2007-2012	

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: As in 2007-2012, fixed dune habitat in the northern part of the Maharees Peninsula at Kilshannig. Access is available from a number of tracks and roads.

Discussion:

This site has considerable habitat which has good potential for Vertigo angustior. In their 2011 report, Moorkens & Killeen stated that it was being grazed by cattle, and at an optimal level to provide habitat for the snail. In 2014, much of the habitat was grazed too tightly - there was little Festuca rubra thatch build-up. Consequently, there needs to be a slight relaxation in grazing at the site. However, the change needed is small, and great care must be taken when organising this with the landowner/land manager - abandonment of grazing would also quickly become detrimental to the species' habitat. There is very good scope for the species at this site, pending slight management changes.

Monitoring recommendations:

It is recommended that the site be monitored as per Moorkens & Killeen (2011) on a 3 yearly basis, owing to the apparent decrease Vertigo angustior population at the site. To increase the spread of samples it was decided to drop Transect 2 in the current sampling period. Instead a required to take spot samples is added. Prescription as follows:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable, and Too dry, Optimal wetness, Too wet, respectively
- Take 1 sample each from at least 6 locations with the most suitable habitat on the transect and analyse for molluscan composition
- Take at least 6 samples from across the site, approximately 2 per polygon
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

The cattle grazing level at Kilshannig is slightly too high. A slight decrease in grazing could benefit Vertigo angustior by allowing more of a build-up of litter and Festuca rubra thatch in areas, though care must be taken to prevent the level of grazing dropping to a point that would allow areas to become more rank or scrub over. Liaison with the landowner/occupier will be required to achieve this.

Vertigo angustior monitoring at Kilshannig

2007-2012

Area of occupancy: Fixed dune habitat in the northern part of the Maharees Peninsula at Kilshannig. Access is available from a number of tracks and roads.

Discussion:

This site has very high quality stable fixed dune habitat, which is being managed sustainably for V. angustior. Parts of the lower slopes are cropped quite low, where the cattle favour, but this seems to suit the lady's tresses Spiranthes at the site. There is some damage where cattle are moved in and out of the site, but this is an acceptable sacrificial area allowing sustainable grazing in an extensive site.

This site is worthy of SAC status, although V. angustior is not a qualifying interest in the cSAC.

Monitoring recommendations:

Although the Condition of the site, both in terms of habitat and Vertigo angustior distribution and abundance is favourable, it is still recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2011
Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 6 locations with the most suitable habitat on the transect and analyse for molluscan composition
- Take 1 sample each from at least 2 locations with the most suitable habitat on Transect 2 and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Additional surveillance at 6 yearly intervals:

Frequency: Next monitoring due 2014
Methods (see Section 3 of main report for full details). Prescription as follows:
- Describe habitat and take at least 3 samples from the most suitable habitat in each of Polygons A (away from transect), B and C and analyse for molluscan composition

Management recommendations:

Existing Management

The site is currently seasonally grazed by moderate numbers of cattle, with less than a grazing unit per hectare.

Proposed management prescription for site

No changes are proposed to the current grazing regime at Kilshannig, which suits V. angustior very well.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Kinlackagh Bay

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM06 **County:** Donegal

SAC Site Code: 001975 Ballyhoorisky Point to Fanad Head

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	7-8 July 2014	Maria Long & Fionnuala O'Neill
2007-2012	5 August 2008	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitats in which Vertigo angustior is present are the fixed grey dunes (Annex I 2130, CORINE 16.22) and the ecotone between the fixed dunes and the Eelburn Stream edge as it flows between the dunes (Romão, 1996; Devillers et al., 1991). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of this unshaded habitat. The dominant vegetation is Festuca rubra, with Ammophila arenaria higher up, corresponding to SD7 of Rodwell (2000), and Lotus corniculatus, Plantago lanceolata, Trifolium repens, Galium verum and Viola tricolour lower down the slope, corresponding to SD8 of Rodwell (2000). Towards the river edge Festuca rubra and Potentilla anserina become co-dominant, corresponding to MG11 of Rodwell (1992). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra, with sparse Ammophila arenaria, Geum verum, Pilosella officinarum, Anacamptis pyramidalis, Plantago lanceolata and other low growing herbs. Grassland with Potentilla anserina on the flatter zones. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

There are large areas of habitat with good potential for Vertigo angustior at Kinlackagh, and the snail has been found in low to moderate numbers across Polygon A (2008 and 2014 surveys), as well as in low numbers in Polygons B and C (2014 survey). Polygon A, the main and largest area, appears to have had varying management regimes in recent years. In 2014, the after-effects of excessive grazing were apparent at the western end. At the eastern end things were quite different, with well-developed marram, as well as Festuca thatch. In fact, in places the vegetation was a little rank and under-grazed here. Overall, however, there is good scope for the target species across this polygon, and small changes in management would be likely to yield good results. Polygon B is small and vulnerable, and being seriously damaged by human trampling. Fencing and the creation of a pathway to funnel human traffic is recommended immediately. The eastern section of Polygon C has good potential for Vertigo angustior, but management needs careful consideration.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	C 18943 44501	Dune crest
End point:	C 18965 44554	Small dune ridge by stream
Transect length:	59	**Direction:** S-N
Description:	As for 2007-2012	
Sampling frequency:	As for 2007-2012	

Vertigo angustior monitoring at Kinlackagh Bay

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point: C 18945 44507 Top of a dune ridge

End point: C 18966 44552 The 1.5m drop down to the beach

Transect length: 59 **Direction:** S-N

Description: The transect runs down a dune slope then across short turf into taller Festuca sward and then finally into unfixed dune with marram just before the beach. The transect runs towards a large white building on the headland across the bay.

Sampling frequency: Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Six samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	36.1403	Polygon A status unchanged. Largest area with best expanses of fixed dune habitat. Boundary changed slightly including removal of houses and curtilage and movement of eastern boundary to fenceline. (Area presented in 2007-2012 incorrect)
B	Suboptimal-Unsuitable	0.8342	Polygon B status dropped to Suboptimal-Unsuitable due to creation of car park and consequenct excessive trampling. Boundary changed to remove car park and improved grassland to the west and the boundary between B and C chnaged to match fenceline
C	Suboptimal-Unsuitable	16.6328	Polygon C status upgraded to Suboptimal-Unsuitable due to discovery of potentially suitable habitat at eastern end along with finding of Vertigo angustior there. Boundary change between B and C to match fenceline.
D	Unsuitable	60.6608	Polygon D remains Unsuitable due to heavy agricultural use. Boundary change at border with A to match fenceline.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal with optimal areas	16.438	Polygon A in central part of bay. In 2006, Area A had no evidence of grazing animals during the survey, and was managed by exposure and human trampling. However, in 2008, the flatter areas had been severely damaged by cattle, horses, supplementary feeding and tyre tracks, such that the dune grassland was badly trampled, grazed to ground level with many bare patches, an abundance of dung, and some heaps of rubbish.
B	Sub-optimal with optimal areas	1.496	Polygon B western part of bay. Area B includes a car park area but has unmanaged dune grassland surrounding the tarmac area
C	Unsuitable	6.24	Polygon C towards western part of bay. Area C is heavily grazed by cattle including supplementary feeding.
D	Unsuitable	34.7	Polygon D at eastern end is managed by cattle grazing with the result that the habitat is compacted and has considerable bare areas, and also sheep grazing which results in a very tightly cropped sward with many bare areas.

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		10m	10.6m	9.2m	29.2m	39.8m		19.2m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		NA	29.2m	NA	29.8m	29.2m		29.8m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 Transect 1 (3 samples)							
2013-2018	1	1	6.5m	0	0	0	Suboptimal-Unsuitable

2013-2018	1	2	12m	0	0	0	Suboptimal
2013-2018	1	3	44.5m	0	0	0	Optimal-Suboptimal
Monitoring period 2007-2012 Transect 1 (6 samples)							
2007-2012	1	1	2m	0	0	0	
2007-2012	1	2	7m	0	0	4	
2007-2012	1	3	13.5m	0	0	8	
2007-2012	1	4	20m	0	0	0	
2007-2012	1	5	34m	0	0	29	
2007-2012	1	6	42m	0	0	1	

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 (6 samples)						
2013-2018	01	C 17389 44504	1	0	1	Suboptimal
2013-2018	02	C 18412 44407	1	2	3	Optimal-Suboptimal
2013-2018	03	C 19451 44700	1	0	1	Optimal
2013-2018	04	C 19535 44827	1	0	1	Optimal
2013-2018	05	C 19185 44469	0	0	0	Optimal
2013-2018	06	C 18780 44463	0	0	0	Suboptimal
Monitoring period 2007-2012 (7 samples)						
2007-2012	01	C 18849 44475	0	0	17	
2007-2012	02	C 18776 44460	0	0	1	
2007-2012	03	C 18771 44519	0	0	1	
2007-2012	04	C 18758 44520	0	0	1	
2007-2012	05	C 19048 44562	0	0	1	
2007-2012	06	C 19141 44564	0	0	1	
2007-2012	07	C 19115 44580	0	0	0	

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the grassland zones (0-45.7 m): on the dune slope (0-15.3 m), in the open central area (15.3-31.8 m), and the grassier zone near the fence (31.8-45.7 m)	Adult or sub-adult snails absent from the transect	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the grassland zones (0-45.7m): on the dune slope (0-15.3m), in the open central area (15.3-31.8m), and the grassier zone near the fence (31.8-45.7m)	Present in 2 zones	Fail

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in 4 other locations with optimal habitat (should include sites to west and east of the transect) (minimum 6 samples)	Adult or sub-adult snails are present in 4 other locations with optimal habitat (including sites to west and east of the transect) (6 samples)	Pass

2007-2012	Presence/Absence	Adult or sub-adult snails are present in 4 other locations with optimal habitat (should include sites to west and east of the transect) (minimum 6 samples)	Present at 6 other locations	Pass

Mon. period	Population Notes
2013-2018	Vertigo angustior is found across much of the site. The snail was found at five of thirteen sample locations in 2007-2012, including four samples on the transect, and four of nine in the current study, with none on the transect. This suggests a decline in the population in what was previously considered the core area, but also that the snail is more widely distributed at the site that previously known. Based on the criteria of Moorkens & Killeen (2011), the population assessment is Unfavourable Inadequate (amber).
2007-2012	The snail is very scattered in its distribution and there are few places where it is moderately frequent rather than present only in rather low numbers.

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	40m of habitat along the first 45m of the Transect is classed as Suboptimal or better	20.6m of habitat along the first 45 m of the Transect is classed as Optimal or Sub-Optimal	Fail
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 35-40 m of the first 45 m along the Transect	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 25.8 m of the first 45 m along the Transect	Fail
2007-2012	1	Habitat extent	40m of habitat along the first 45m of the Transect is classed as Optimal or Sub-Optimal	28.5m is Sub-Optimal	Fail
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 35-40m of the first 45m along the Transect	28.5m is optimal wetness	Fail

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	More than 16ha of the site sub-optimal with optimal areas	36ha Suboptimal	Pass
2007-2012	Habitat extent	More than 16 ha of the site sub-optimal with optimal areas	36.4 ha Sub-optimal	Pass

Mon. period	Habitat Notes
2013-2018	Polygon A remains classified as Suboptimal. Some areas within this polygon are of excellent quality for Vertigo angustior (particularly to the east of the caravan park), but other areas appear to have been heavily grazed in the past (lots of dung evident and no thatch/litter layer). Polygon B was moved from Sub-optimal to Suboptimal-Unsuitable. This is because it is not grazed and is consequently quite rank, and most of it is too mobile (i.e. lots of loose sand) to be suitable for Vertigo angustior. Additionally, it is heavily trampled by humans. Polygon C has been upgraded from Unsuitable to Sub-optimal/Unsuitable due to the presence of a sizeable area of potentially good habitat (good Festuca thatch) at the eastern end. Vertigo angustior was found here in the current survey. Much of the polygon, however, remains less suitable, with an abundance of agricultural grasses. Polygon D remains Unsuitable and is tightly grazed by sheep in places. Based on the criteria of Moorkens & Killeen (2011), the habitat assessment is Unfavourable Bad (red) .
2007-2012	There is a relatively large area which is potentially suitable for V. angustior, but most of it can only be classed as sub-optimal.

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.01.01	intensive cattle	Inside	High	Negative	20%	Presumed very heavy grazing in

2013-2018	A04.01.01	grazing	Inside	High	Negative	20%	recent years (almost no litter, v high cover of old dung).
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Medium	Positive	70%	Particularly optimal east of caravan park.
2013-2018	A04.02.03	non intensive horse grazing	Inside	Low	Positive	20%	One horse seen during survey.
2013-2018	A04.03	abandonment of pastoral systems, lack of grazing	Inside	Low	Negative	5%	
2013-2018	A11	Agriculture activities not referred to above	Inside	Medium	Negative	25%	Grassy with Holcus, Arrhenathrum & Dactylis sward, cause unknown (reseeding/fertiliser?) Unsuitable habitat for V. angustior.
2013-2018	D01.01	paths, tracks, cycling tracks	Inside	Low	Negative	0.5%	
2013-2018	G02.08	camping and caravans	Inside	Low	Negative	3%	Caravan park. Long established but continued disturbance from residents.
2013-2018	I01	invasive non-native species	Inside	Low	Neutral	0.5%	About 4 small plants of Hippophae rhamnoides near
2013-2018	K01.01	Erosion	Outside	Low	Negative	3%	Erosion of soft cliff at site edge by sea.
2013-2018	K04.05	damage by herbivores (including game species)	Inside	Low	Neutral	15%	Rabbit grazing.
2007-2012	A04.01.01	intensive cattle grazing	Inside	Medium	Negative	8ha	Prevalent throughout the best Vertigo angustior habitat and has increased since 2006.
2007-2012	A04.01.02	intensive sheep grazing	Inside	High	Negative	34.7ha	To the east of the site the 34.7 hectare block of habitat is unsuitable for V. angustior because it is very intensively cropped by grazing sheep, well short of the height of vegetation necessary for the species.
2007-2012	A05.02	stock feeding	Inside	Medium	Negative	2ha	
2007-2012	D01.01	paths, tracks, cycling tracks	Inside	High	Negative	2ha	Paths and desire lines from human trampling that concentrates in this area because of the caravans is also lowering the quality of the habitat.
2007-2012	D01.03	car parks and parking areas	Inside	Medium	Negative	1.5ha	The car park at the west of the site has destroyed some suitable habitat, and the human trampling that concentrates in this area due to the parking facility is exacerbating the negative effect in a wider area.
2007-2012	G02.08	camping and caravans	Inside	Medium	Negative	8ha	The caravan park in the centre of the site is located in some of the best natural habitat and thus has destroyed a considerable part of the habitat.

Mon. period	Future Prospects Notes
2013-2018	There are a diversity of management regimes and impacts across this site. Some areas receive optimal levels of grazing (for Vertigo angustior), while other areas are, or have been, overgrazed. This overgrazing removes the litter/thatch layer that Vertigo angustior requires. This problem of overgrazing seems to be lessening at this site, particularly in the western side of Polygon A. Human trampling is a big issue in Polygon B. The creation of a car park and the resulting trackways to the beach have rendered this small area less suitable for V. angustior. Overall, however, the habitat for the species at this site has probably marginally improved. This will only continue to be the case if appropriate grazing management is carefully applied. Based on the activities noted at the site, and their impacts on the habitat and species, the future prospects for Vertigo angustior at this site are classed as being Unfavourable Inadequate (amber). Should further and continued improvements be noted at the next assessment, this may be reviewed.
2007-2012	As the major impacts (caravan park, car park) have been present for many years, the snail has survived in the remaining habitat, and therefore Future prospects have been assessed as Unfavourable inadequate (amber) rather than bad.

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Amber	Red	Amber	Red
2007-2012	Amber	Red	Amber	Red

Mon. period	Overall Notes
2013-2018	Based on the results of the population and habitat assessment (despite small signs of habitat improvement noted), along with the Future Prospects, the overall assessment for Kinlackagh Bay is Unfavourable Bad (red).
2007-2012	The Condition of the site and the feature based upon the 2008 survey has been assessed as Unfavourable Bad. This represents the deterioration since 2006, when the site was assessed as Favourable

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: As in 2007-2012, the habitat that supports Vertigo angustior within this cSAC is the fixed grey dune habitat at Kinlackagh, Ballyhieran Bay towards the north west of the cSAC. Access is from the track from Eelburn Bridge

Discussion:

There are large areas of habitat with good potential for Vertigo angustior at Kinlackagh, and the snail has been found in low to moderate numbers across Polygon A (2008 and 2014 surveys), as well as in low numbers in polygons B and C (2014 survey). Polygon A, the main and largest area, appears to have had varying management regimes, with no grazing apparent in 2006, very heavy usage and damage reported in 2008, and a mixed picture in 2014. In 2014, the after-effects of excessive grazing were apparent at the western end, with only scattered small plants of Ammophila arenaria, and little to no Festuca rubra thatch. Extensive, though localised, clumps of nettles pointed to past supplementary feeding sites, though no current supplementary feeding was noted. The only grazer noted was a single horse. At the eastern end things were quite different, with well-developed Ammophila arenaria, as well as Festuca rubra thatch. In fact, in places the vegetation was a little rank and under-grazed. Overall, however, there is good scope for the target species across this polygon, and small changes in management would be likely to yield good results for the species.

Polygon B is small and vulnerable, and being seriously damaged by human trampling. Fencing and the creation of a pathway to funnel human traffic is recommended immediately. The eastern section of Polygon C has good potential for Vertigo angustior, but management needs careful consideration here. Liaison with landowners/land managers is required to ensure the correct balance is met. Polygon D is likely to be too altered by agricultural use to hold much suitable habitat, either now or in the future.

Monitoring recommendations:

This site should be monitored at a minimum of six-yearly intervals. Should management interventions be made, this should be increased to yearly or three-yearly so that changes can be assessed. The detailed monitoring protocol of Moorkens & Killeen (2011) should continue to be followed, but with the inclusion of Polygon C:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too dry, Optimal wetness or Too dry, respectively
- Take at least 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
-Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations (should include sites to west and east of the transect, and include polygons B and C) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

The western end of Polygon A had suffered from heavy management around 2007/2008 (see Moorkens and Killeen (2011) notes below), but in 2014 appeared to be recovering. Grazing by cattle, at low levels, is probably the optimal management for this polygon. Polygon B would greatly benefit from exclusion of humans, but this is likely to be difficult to implement given the building of a car park in this area. This polygon is very small in area and extremely vulnerable. The western half of the polygon does not currently contain any suitable Vertigo angustior habitat (tightly and heavily grazed) and appears to have been agriculturally improved. A small and sensitively designed and installed pathway should be created immediately to funnel human traffic from the car park to the beach and the remaining dune should be fenced off. The eastern end of Polygon C appears to receive close to optimal management for Vertigo angustior currently, and so no change is recommended here. The western section has an abundance of agricultural grasses and may not produce habitat suitable for the target species, even with changes to grazing management. However, no further intensification of agricultural management should be allowed.

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the fixed grey dune habitat at Kinlackagh, Ballyhieran Bay towards the north west of the cSAC. Access is from the track from Eelburn Bridge

Discussion:

The Condition of the site and the feature based upon the 2008 survey has been assessed as Unfavourable Bad. This represents the deterioration since 2006, when the site was assessed as Favourable.

This deterioration is considered to be a result of changes in grazing practice. The habitat and snail numbers in first 13m of the transect which runs down the dune slope are essentially unchanged, but the flatter areas have been severely damaged by cattle, horses, supplementary feeding and tyre tracks, such that the dune grassland was badly trampled, grazed to ground level with many bare patches, an abundance of dung, and some heaps of rubbish.

Monitoring recommendations:

Given the evidence for an overall deterioration in the Condition of the site, both in terms of habitat and Vertigo angustior distribution and abundance, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2013
Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take at least 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations (should include sites to west and east of the transect, and include polygon B) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

The site is divided into 4 polygon units A to D (Figure 1). The V. angustior habitat is largely restricted to A and B.

In 2006, Area A had no evidence of grazing animals during the survey, and was managed by exposure and human trampling. However, in 2008, the flatter areas had been severely damaged by cattle, horses, supplementary feeding and tyre tracks, such that the dune grassland was badly trampled, grazed to ground level with many bare patches, an abundance of dung, and some heaps of rubbish. Area B includes a car park area but has unmanaged dune grassland surrounding the tarmac area. Area C is heavily grazed by cattle including supplementary feeding. Area D is managed by cattle grazing with the result that the habitat is compacted and has considerable bare areas, and also sheep grazing which results in a very tightly cropped sward with many bare areas.

Proposed management prescription for site (from 2006 survey)

In 2006 it was considered that the management at Kinlackagh was only suitable for V. angustior in the recreational dune area to the east and west of the track at Eelburn Bridge, and at the car park area at the western part of the bay, and in both cases there is no grazing management but presumably some human trampling. It was recommended (Moorkens 2007) that this management (i.e. in polygon areas A and B) should continue during the 2007-2011 period. The results of the 2008 survey show that horses and cattle have been penned into the central fixed dune area and that they have caused considerable damage (see Section 6). It is strongly recommended that these grazing levels and associated activities are reduced.

The habitats to the south of the main road have been fertilized and reseeded and are no longer natural habitats. While it was worth considering and surveying these areas because of the high water table nearby, the intensification of the land use there means that they should be excluded from V. angustior conservation effort. Similarly, an area within Area A has been degraded by use as a caravan park. The dune grassland of areas C and D areas have not been intensively destroyed by nutrient addition, but have been degraded by heavy grazing over time. As these areas are flatter and less mobile than the dune areas, it is not possible to say absolutely that it may be possible to increase V. angustior habitat, but there are pockets of potential habitat, and there is much nicer flora and vegetation structure in the less grazed areas, so a reduction in grazing would benefit the overall biodiversity. The intensity of grazing should be set to maximize the botanical potential as it is not naturally ideal habitat for the snail.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Maharees

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM07 **County:** Kerry

SAC Site Code: 002070 Tralee Bay and Magharees Peninsula, West to Cloghane

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	26-30 May 2014	John Brophy & Maria Long
2007-2012	29-31 July 2008	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). There is also some potential habitat within the ecotone between the fixed dunes and dune. At Fermoyle there are areas of Transition marsh with Iris, Caltha palustris, Lychnis flos-cuculi, and Mentha aquatica. The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is Festuca rubra, with some Ammophila arenaria, corresponding to SD7 of Rodwell (2000), and Lotus corniculatus, Pilosella officinarum, Trifolium repens, Galium verum, and Euphrasia lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra, with sparse Ammophila arenaria, Geum verum, Euphrasia sp. Pilosella officinarum and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure. OR Ecotone between Festuca grassland and dune slack with Potentilla anserina OR Transition marsh with Iris, Caltha palustris, Lychnis flos-cuculi, Mentha aquatica (height 25-40cm). Under-storey of moss and litter
Unsuitable	Not defined

2. SUMMARY:

This is a large site, with eight polygons, and stretching over 9 km. There are differing management regimes in almost all polygons, and this results in a mixed picture for Vertigo angustior across the site. The species was found in three polygons, F, G and H, all in the central portion of the site. The 2007-2012 survey found the species only in Polygons E and F. Given that the species is also known from the adjacent site VaCAM05 (Kilshannig), it can be assumed that the species has a widespread, if sparse, distribution across suitable habitat in this area.

At this site, the main management issue is cattle grazing, and associated activities (e.g. supplementary feeding). Some polygons are undergrazed in places (e.g. western end of Polygon E), but more commonly, polygons are overgrazed (e.g. parts of all of E, G, H, I, J and K). In particular, the polygons at the west of the site (I, J, and K) are particularly heavily grazed, with K being so much so that there are extensive areas of bare ground. Clearly these areas are highly unsuitable for Vertigo angustior as it needs a build-up of moist thatch or moss. Within Polygons D, E, G and H in particular, liaison is needed immediately with landowners/land managers to negotiate more appropriate management regimes.

Polygon F contains a golf course, and management here should remain as it is. The roughs are in excellent condition as Vertigo angustior habitat.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	Q 60357 14494	Gatepost.	
End point:	Q 59855 14485		
Transect length:	502	**Direction:**	W-E
Description:	As for 2007-2012		
Sampling frequency:	As for 2007-2012		

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	Q 60357 14495	Old stone gate posts
End point:	Q 59855 14484	Dune crest near coast
Transect length:	506	**Direction:** W-E

Description: The transect runs across undulating fixed dune grassland, areas of unfixed dune, cattle-grazed grassland, and across the northern part of a slack. A range of vegetational habitat s are present: Festuca-dominated, marram-dominated, and in places with a diversity of low growing herbs. Much of the habitat grazed by cattle and height ranges from 0.2m in height to over 0.5m.

Sampling frequency: Samples were taken at 13 locations approximately 40-50m apart along the transect principally from zones with the most suitable habitat (note: most of the first 250m was unsuitable with some sub-optimal areas, as was the c. 70m across the slack). At each location (Section 3.2), a brief description was made of the habitat and principal plant composition. Samples were either inspected in the field or analysed in the laboratory for their snail composition

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
D	Suboptimal-Unsuitable	115.2402	Polygon D status remains Suboptimal-Unsuitable. The polygon includes a large area of fixed dune and dune slacks.
E	Suboptimal	29.3513	Polygon E status is reduced from Optimal and Sub-optimal to Suboptimal. Fixed dune habitat has decreased in suitabilitiy in one fenced area due to overgrazing and one due to undergrazing, leading to rank vegetation.
F	Suboptimal	20.2577	Polygon F status remain Suboptimal. The polygon includes a links golf course, with suitable fixed dune habitat found in the rough, but lacking in fairways, greens and tracks.
G	Suboptimal	9.3735	Polygon G status is upgraded to Suboptimal due to presence of suitable fixed dune habitat within polygon, despite parts showing agricultural improvement.
H	Suboptimal-Unsuitable	15.2513	Polygon H status remains Suboptimal-Unsuitable. The polygon contains limited suitable fixed dune habitat and is mainly agriculturally improved, with areas affected by grass-specific herbicide.
I	Suboptimal-Unsuitable	8.7476	Polygon I status remains Suboptimal-Unsuitable. The habitat is more wet than other polygons, with marsh habitat dominating. Slight boundary change to reflect boundaries on the ground.
J	Suboptimal-Unsuitable	9.4965	Polygon J status remains Suboptimal-Unsuitable. The habitat is more wet than other polygons, with marsh habitat present. Slight boundary change to reflect boundaries on the ground.
K	Unsuitable	5.8099	Polygon K status downgraded to Unsuitable from Suboptimal and Unsuitable. Fixed dune habitat, but heavily overgrazed

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
D	Sub-optimal with unsuitable areas	121.4	Polygon D - Mosaic of Fixed and unfixed dunes, includes a large slack area (area 6.18 ha). Relatively heavily grazed by cattle.
E	Sub-optimal with unsuitable areas	31.47	Polygon E - Undulating fixed dune grassland, areas of unfixed dune, cattle-grazed grassland, and a large slack (area 2.05 ha)
F	Sub-optimal	20.26	Polygon F - area of fixed dunes and golf course
G	Sub-optimal with unsuitable areas	9.33	Polygon G - NE of Goulane - sub-optimal and unsuitable habitat, mostly unfixed coastal dunes
H	Sub-optimal with unsuitable areas	15.08	Polygon H - Goulane - sub-optimal and unsuitable habitat, mostly unfixed coastal dunes
I	Sub-optimal with unsuitable areas	9.01	Polygon I - Fermoyle – sub-optimal and unsuitable habitat. Mostly Iris marsh with coastal strip of fixed dune habitat
J	Sub-optimal with unsuitable areas	9.81	Polygon J - Fermoyle – sub-optimal and unsuitable habitat. Mostly Iris marsh with coastal strip of fixed dune habitat
K	Sub-optimal with unsuitable areas	5.81	Polygon K - Fermoyle – sub-optimal and unsuitable habitat. Heavily grazed grassland

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Vertigo angustior monitoring at Maharees

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		97m	8m	100m	297m	105m	57m	340m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	see below	NA	approx 186m some of which is	NA	approx 320m			

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 Transect 1 (6 samples)							
2013-2018	1	1	Q 60237 14488	0	0	0	Unsuitable
2013-2018	1	2	Q 60022 14482	0	0	0	Suboptimal-Unsuitable
2013-2018	1	3	Q 59958 14488	0	0	0	Suboptimal
2013-2018	1	4	Q 59933 14483	0	0	0	Optimal-Suboptimal
2013-2018	1	5	Q 59895 14478	0	0	0	Optimal-Suboptimal
2013-2018	1	6	Q 59865 14479	0	0	0	Optimal-Suboptimal
Monitoring period 2007-2012 Transect 1 (13 samples)							
2007-2012	1	1	Q60357 14495 Heavily cattle-grazed grassland near gate posts with weeds	0	0	0	
2007-2012	1	2	Q60316 14493 Low fixed dune mound	0	0	0	
2007-2012	1	3	Q60291 14492 Mosaic of undulating mounds and cattle-trampled flats	0	0	0	
2007-2012	1	4	Q60240 14491 Mosaic of undulating mounds and cattle-trampled flats	0	0	0	
2007-2012	1	5	Q60198 14493 Generally unsuitable grassland habitat	0	0	0	
2007-2012	1	6	Q60166 14490 Generally unsuitable grassland habitat	0	0	0	
2007-2012	1	7	Q60103 14485 Good Festuca-dominated habitat	0	0	0	
2007-2012	1	8	Q60058 14487 Good Festuca-dominated habitat	0	0	0	
2007-2012	1	9	Q60018 14487 Boundary fence at edge of slack	0	0	0	
2007-2012	1	10	Q59984 14489 Boundary of slack	0	0	0	
2007-2012	1	11	Q59932 14484 Base of fixed dune	0	0	1	

2007-2012	1	12	Q59871 14475 Good fixed dune	0	0	1	
2007-2012	1	13	Q59855 14484	0	0	0	

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 (12 samples)						
2013-2018	01	Q 61719 15805	0	0	0	Suboptimal
2013-2018	02	Q 61619 15427	0	0	0	Optimal-Suboptimal
2013-2018	03	Q 61019 15296	0	0	0	Suboptimal
2013-2018	04	Q 59137 13857	1	0	1	Optimal
2013-2018	05	Q 59448 14122	0	0	0	Optimal
2013-2018	06	Q 59366 13906	0	0	0	Optimal
2013-2018	07	Q 58736 13501	0	0	0	Suboptimal
2013-2018	08	Q 58830 13589	1	0	1	Optimal
2013-2018	09	Q 58247 13011	1	0	1	Optimal-Suboptimal
2013-2018	10	Q 53949 12384	0	0	0	Suboptimal-Unsuitable
2013-2018	11	Q 54588 12239	0	0	0	Suboptimal
2013-2018	12	Q 54916 12200	0	0	0	Suboptimal
Monitoring period 2007-2012 (13 samples)						
2007-2012	F1	Q 59448 11430	0	0	3	
2007-2012	F2	Q 59127 13858	0	0	4	
2007-2012	H1	Q 57613 12727	0	0	0	
2007-2012	H2	Q 57692 12771	0	0	0	
2007-2012	H3	Q 57777 12829	0	0	0	
2007-2012	H4	Q 57803 12835	0	0	0	
2007-2012	I1	Q 54844 12218	0	0	0	
2007-2012	I2	Q 54854 12273	0	0	0	
2007-2012	J1	Q 54302 12262	0	0	0	
2007-2012	J2	Q 54113 12311	0	0	0	
2007-2012	J3	Q 53924 12383	0	0	0	
2007-2012	J4	Q 53956 12377	0	0	0	
2007-2012	J5	Q 53958 12360	0	0	0	

5. CONDITION ASSESSMENT

5.1 Population Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in at least 4 locations on the Maharees transect with optimal and sub-optimal habitat (minimum 6 samples)	Adult or sub-adult snails absent from the Maharees transect (6 samples)	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in at least 4 locations on the Maharees transect with optimal and sub-optimal habitat (minimum 6 samples)	Present in 2 samples	Fail

Mon. period	Indicator	Target	Result	Pass/Fail

2013-2018	Presence/Absence	Adult or sub-adult snails are present in at least 1 location in the fixed dune area of polygon F (golf course) (minimum 3 samples)	Adult or sub-adult snails are present in 1 location in the fixed dune area of polygon F (golf course) (3 samples)	Pass
2013-2018	Species extent	Adult or sub-adult snails are present in at least 1 location at Fermoyle (minimum 3 samples)	Adult or sub-adult snails are absent from Fermoyle (from 3 samples)	Fail
2007-2012	Presence/Absence	Adult or sub-adult snails are present in at least 1 location in the fixed dune area of polygon F (golf course) (minimum 3 samples)	Present in 2 samples	Pass
2007-2012	Species extent	Adult or sub-adult snails are present in at least 1 location at Fermoyle (minimum 3 samples)	Not found	Fail

Mon. period	Population Notes
2013-2018	Fewer positive samples for Vertigo angustior were recorded in the current survey than in 2007-2012 (three compared to four). While the snail continues to be absent from Fermoyle (polygons I, J and K), it now also appears to be absent from the transect in Polygon E, and also Polygon D. The snail was present in polygons F (golf course), G and H. The snail was not recorded from polygons G and H in 2007-2012. Based on the criteria of Moorkens & Killeen (2011), the population assessment is Unfavourable Bad (red).
2007-2012	

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	At least 300 m of the habitat along the transect should be classed as suboptimal or better	205 m of the habitat along the transect classed as Suboptimal or better	Fail
2007-2012	1	Habitat extent	At least 300m of the habitat along the transect should be classed as Optimal and sub-optimal	183m is optimal and sub-optimal	Fail

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	At least 50% of the habitat in polygons D, E and F is classed as optimal and sub-optimal	49.7ha Optimal-Suboptimal and Suboptimal (30%)	Fail
2013-2018	Habitat quality	At least 50% of the habitat in polygons I and J (Fermoyle) is classed as optimal and/or sub-optimal	0.0ha Suboptimal or above	Fail
2007-2012	Habitat extent	At least 50% of the habitat in polygons D, E and F is classed as optimal and sub-optimal	Approx 16.5 ha, not including dune slacks	Fail
2007-2012	Habitat quality	At least 50% of the habitat in polygons I and J (Fermoyle) is classed as optimal and/or sub-optimal	100% is Unsuitable with sub-optimal areas	Fail

Mon. period	Habitat Notes
2013-2018	The habitat suitability classification remains unchanged from 2007-2012 in polygons D, F, H, I and J. Polygon E was dropped from Optimal and sub-optimal to Suboptimal due to changes caused by overgrazing by cattle in some areas and undergrazing in others. Polygon G was upgraded from Sub-optimal and unsuitable to Suboptimal due to an improvement in the habitat present, with more Ammophila arenaria with Festuca rubra thatch. Polygon K was dropped from Sub-optimal and unsuitable to Unsuitable due to the high level of grazing resulting in an extremely short sward unsuitable for Vertigo angustior. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment is Unfavourable Bad (red).
2007-2012	

5.3 Future Prospects Assessment

Vertigo angustior monitoring at Maharees

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.01.01	intensive cattle grazing	Inside	High	Negative	4%	Supplementary feeding and heavy grazing
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	90%	
2013-2018	A07	use of biocides, hormones and chemicals	Inside	High	Negative	5%	Grass-killing herbicide
2013-2018	C01.01	Sand and gravel extraction	Inside	High	Negative	1%	
2013-2018	D01.01	paths, tracks, cycling tracks	Inside	Medium	Negative	1%	
2013-2018	G02.01	golf course	Inside	Medium	Neutral	10%	V. angustior present on golf course since 2008
2013-2018	H05.01	garbage and solid waste	Inside	Low	Negative	1%	300 sq. m
2013-2018	I01	invasive non-native species	Inside	High	Negative	3%	Sea Buckthorn - Hippophae rhamnoides
2013-2018	I02	problematic native species	Inside	Medium	Negative	1%	Bracken - Pteridium aquilinum
2013-2018	K01.01	Erosion	Inside	High	Negative	1%	
2013-2018	K04.05	damage by herbivores (including game species)	Inside	Medium	Negative	1%	Rabbits
2007-2012	A04.01.01	intensive cattle grazing	Inside	High	Negative	24ha	
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	160ha	While the cattle grazing regime cannot be classed as intensive in polygons D and E, the level of grazing is too intensive in its nature to meet conservation objectives for a large population of this species into the future.
2007-2012	G02.01	golf course	Inside	Low	Neutral	20.26ha	The grazing and damage in polygons I, J and K is severe. At present, only the higher dune areas of the cattle grazed areas and the golf course rough areas are supporting V. angustior.

Mon. period	Future Prospects Notes
2013-2018	The main activity affecting the Vertigo angustior habitat at the Maherees is grazing by cattle. The grazing level is too high across much of the habitat, in particular at Fermoyle. Polygon E includes areas of undergrazing and overgrazing, separated by fencing. Other activities include a golf course, which is probably having a neutral effect by providing optimal areas within unsuitable ones, the use of biocides, which is having a high negative effect, and dumping. The management of cattle was identified as a serious concern by Moorkens & Killeen (2011), and it continues to be the dominant issue at the site. Based on the effect this is having on the Vertigo angustior habitat at the site, and the fact that these effects can be altered by changes in the management regime, the Future Prospects are considered to be Unfavourable Inadequate (amber).
2007-2012	

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Red	Red	Amber	Red
2007-2012	Red	Red	Amber	Red

Mon. period	Overall Notes
2013-2018	The reduction in the number of positive samples, combined with the overall deterioration in the suitability of the habitat at the site for Vertigo angustior and its unfavourable Future Prospects results in an overall assessment of Unfavourable Bad (red).
2007-2012	

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: As in 2007-2012, the habitat that supports Vertigo angustior within this cSAC is the fixed grey dune habitat. Note: the Kilshannig part of the SAC has been assessed separately.

Discussion:

This is a large site, with eight polygons, stretching over 9km. There are differing management regimes in almost all polygons, and this results in a mixed picture for Vertigo angustior across the site. The species was found in three polygons, F, G and H, all in the central portion of the site. The 2007-2012 survey found the species only in polygons E and F. Given that the species is also known from the adjacent site VaCAM05 (Kilshannig), it can be assumed that the species has a widespread, if sparse, distribution across suitable habitat in this area.

At this site, the main management issue is cattle grazing, and associated activities (e.g. supplementary feeding). Some polygons are under-grazed in places (e.g. western end of Polygon E), but more commonly, polygons are overgrazed (e.g. parts or all of E, G, H, I, J and K). In particular, the polygons at the west of the site (I, J, and K) are particularly heavily grazed, with K being so much so that there are extensive areas of bare ground. Clearly these areas are highly unsuitable for Vertigo angustior as it needs a build-up of moist thatch or moss. Within polygons D, E, G and H in particular, liaison is needed immediately with landowners/land managers to negotiate more appropriate management regimes.

Polygon F contains a golf course, and management here should remain as it is. The roughs are in excellent condition as Vertigo angustior habitat.

Monitoring recommendations:

The site should be monitored broadly following the recommendations of Moorkens & Killeen (2011) on a 3 yearly basis, but due the fact that it is a large site with complex management, extra spot samples are required and this requirement has been added below. Prescription as follows:

- Describe habitat and take at least 1 sample each from at least 6 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take at least 3 samples from areas with the most suitable habitat in Polygon F (golf course) and analyse for molluscan composition
- Describe habitat and take at least 6 samples from areas with the most suitable habitat in polygons D, G and H.
- Describe habitat and take at least 3 samples from areas with the most suitable habitat (dune and transition marsh) in polygons I and J at Fermoyle and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

Different management actions are required for different areas/polygons at the Maharees. The level of grazing in polygons D and E should be reduced and supplementary feeding removed in order to allow the vegetation to recover to a more natural state for fixed-dune grassland. However, the area to the west of the fence in Polygon E needs to have grazing reintroduced. The management of the golf course (Polygon F) should continue as is, as the current situation provides Vertigo angustior with suitable habitat in areas off the greens and fairways. Polygons G and H have complex management, much of it detrimental, not only to Vertigo angustior, but to sand dune habitats in general. Immediate negotiation with the landowner/land manager is needed to stop the use of biocides, to remove excessive supplementary feeding and to generally bring land use practices back in line with those appropriate for sand dunes in a protected site. Polygons I, J and K at Fermoyle are suffering from overgrazing, particularly Polygon K, which is very tightly grazed with much bare ground and Ammophila limited to steep slopes down to the shore, and these areas are somewhat sandy and mobile. Animals should be removed from polygons I, J and K for a period to allow the recovery of the vegetation and an increase in the litter and Festuca rubra thatch .

Vertigo angustior monitoring at Maharees

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the fixed grey dune habitat. Note: the Kilshannig part of the SAC has been assessed separately

Discussion:

Monitoring recommendations:

Management recommendations:

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Dog's Bay

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM08 **County:** Galway

SAC Site Code: 001257 Dog's Bay

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	8-9 June 2015	John Brophy & Maria Long
2007-2012	11 April 2009	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

This general habitat in which Vertigo angustior is present corresponds to fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The dominant vegetation is Festuca rubra with Ammophila arenaria, corresponding to SD7 of Rodwell (2000), and Festuca rubra dominated vegetation with Galium verum, Campanula rotundifolia, Euphrasia, Holcus lanatus, Anacamptis pyramidalis, and Plantago lanceolata, corresponding to SD8 of Rodwell (2000). Around a freshwater upwelling, there is an ecotone between Festuca rubra and Potentilla anserina wet grassland and the waterlogged marsh. These are not Annex I nor CORINE listed habitats, and are similar to the so called “marsh phase” or inland habitat of Vertigo angustior. The locations of suitable ecotone include Festuca rubra, Potentilla anserina, Iris pseudacorus, Juncus acutiflorus, Carex disticha, Eleocharis palustris, Holcus lanatus, and Oenanthe communities. This includes ecotones that include the Rodwell categories of M28, MG10 and MG11 (Rodwell, 1991, 1992). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of this unshaded habitat. The habitat falls within the more general habitat of freshwater marsh (GM1) and wet grassland (GS4) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	1.Fixed dune, species-rich grassland dominated by Festuca rubra, with sparse Ammophila arenaria, Geum verum, Pilosella officinarum, Anacamptis pyramidalis, Plantago lanceolata and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch. 2.Transition marsh with Iris, Potentilla anserina, Oenanthe sp. (height 25-40cm). Under-storey of moss and litter
Sub-optimal	1.Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure. 2.Vegetation composition as above but either vegetation height is less than 25cm or over 50cm, or the soil is very wet with pools of standing water, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

Although the habitat suitability status of the only polygon at this site remains unchanged at Suboptimal/Unsuitable, the site has decreased in quality since the 2007-2012 monitoring period. This is evident by a comparison with previous photographs taken at individual sample points. There is now very little Ammophila arenaria across the entire site, where previously large stands were present. The vegetation is very short throughout the site (i.e. ≤3 cm), with large areas with open sand/blown sand. There is little or no thatch anywhere. One small area (S06) is fenced and is the only place with Ammophila arenaria in fixed dune, indicating that overgrazing is a problem. The snail continues to survive in a small hollow, but this is showing signs of damage from erosion, putting the future survival of the species at this site at risk.

3. TRANSECT DETAILS

TRANSECT: 0 **MONITORING PERIOD:** 2013-2018

Start point: NO TRANSECT RECORDED

End point:

Transect length: **Direction:**

Description:

Sampling frequency:

TRANSECT: 0 **MONITORING PERIOD:** 2007-2012

Start point: NO TRANSECT RECORDED

End point:

Transect length: 0 **Direction:**

Description:

Sampling frequency:

4. RESULTS

Vertigo angustior monitoring at Dog's Bay

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal-Unsuitable	6.4655	Polygon A status unchanged at Suboptimal-Unsuitable. Area of fixed dune, which is grazed extremely tightly. Very little Ammophila arenaria, apart from isolated fenced patches, so little to no associated Festuca rubra thatch. Polygon expanded slightly to south to include small fenced area where S06 was taken. Ammophila arenaria was present and tall here.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
	Sub-optimal with unsuitable areas	5.995	
	Optimal	0.04	small area of wetland in a hollow surrounded by Festuca slopes

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
0								

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
0								

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 Transect 0 (1 sample)							
2013-2018	0	0	NO TRANSECT RECORDED				
Monitoring period 2007-2012 Transect 0 (1 sample)							
2007-2012	0	0	NO TRANSECT RECORDED				

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 (7 samples)							
2013-2018	01	L 69470 38436	0	0	0		Suboptimal-Unsuitable
2013-2018	02	L 69476 38428	1	0	1	Presence/absence	Suboptimal-Unsuitable
2013-2018	03	L 69103 38020	0	0	0		Suboptimal
2013-2018	04	L 69347 38693	0	0	0		Suboptimal
2013-2018	05	L 69387 38519	0	0	0		Suboptimal
2013-2018	06	L 69300 37908	0	0	0		Suboptimal
2013-2018	07	L 69297 38031	0	0	0		Suboptimal-Unsuitable
Monitoring period 2007-2012 (12 samples)							
2007-2012	01	L 69351 38694	0	0	0		
2007-2012	02	L 69361 38593	0	0	0		
2007-2012	03	L 69386 38555	0	0	0		
2007-2012	04	L 69447 38454	0	0	0		
2007-2012	05	L 69470 38425	0	0	1		
2007-2012	06	L 69470 38339	0	0	0		
2007-2012	07	L 69428 38204	0	0	0		
2007-2012	08	L 69330 38095	0	0	0		

2007-2012	09	L 69277 38058	0	0	0
2007-2012	10	L 69217 38033	0	0	0
2007-2012	11	L 69190 38020	0	0	0
2007-2012	12	L 69122 38063	0	0	0

5. CONDITION ASSESSMENT

5.1 Population Assessment: 1 pass Favourable (green); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	0	N/A	NO TRANSECT RECORDED		
2007-2012	0	N/A	NO TRANSECT RECORDED		

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in the grassy hollow with freshwater upwelling (site 5 of this survey)	Vertigo angustior present in the grassy hollow	Pass
2007-2012	Presence/Absence	Adult or sub-adult snails are present in the grassy hollow with freshwater upwelling (site 5 of this survey)	Present	Pass

Mon. period	Population Notes
2013-2018	Vertigo angustior was found in only one out of seven samples taken as part of the current survey, which compares with one out of twelve in the 2007-2012 survey (Moorkens & Killeen, 2011). The positive samples from each survey came from the same location; a very small hollow with a freshwater upwelling. Based on the criterion of Moorkens & Killeen (2011), the Population Assessment is Favourable (green).
2007-2012	Frequent but confined to one very small area

5.2 Habitat Assessment: 2 passes Favourable (green); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	0	N/A	NO TRANSECT RECORDED		
2007-2012	0	N/A	NO TRANSECT RECORDED		

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Area of occupancy	The habitat area should be optimal or suboptimal at least 400m2 in the hollow at sample site 5, with at least some optimal habitat	No Optimal habitat present	Fail
2013-2018	Habitat type	The habitat in the hollow at Sample Site 5 should be classified as optimal	Habitat in the hollow is classified as Unsuitable	Fail
2007-2012	Area of occupancy	The habitat area should be optimal or suboptimal at least 400m2 in the hollow at sample site 5, with at least some optimal habitat	400m2 is Optimal and sub-optimal	Pass
2007-2012	Habitat type	The habitat in the hollow at Sample Site 5 should be classified as optimal	Habitat is Optimal	Pass

Mon. period	Habitat Notes
2013-2018	Polygon A remains classed as Suboptimal-Unsuitable due to the effects of overgrazing and erosion on the dune grassland. The hollow in which the snail was found in both surveys is also now classified as Suboptimal-Unsuitable due to the effects of erosion, with no optimal habitat present. There are a handful of Iris pseudacorus plants, but relatively little Ammophila arenaria. Rubbish has also been dumped in this small hollow. The erosion is probably caused by storms and by the construction of a concrete ramp adjacent to the hollow. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Dog's Bay is Unfavourable Bad (red).

2007-2012	Vertigo angustior is found in a very small area of habitat

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.02.01	non intensive cattle grazing	Inside	High	Negative	85%	Cattle grazing with many fallen fences
2013-2018	D01.01	paths, tracks, cycling tracks	Inside	High	Negative	1%	
2013-2018	G01.02	walking, horseriding and non-motorised vehicles	Inside	Low	Negative	5%	Human trampling
2013-2018	G05	Other human intrusions and disturbances	Inside	Low	Negative	1%	Campfires
2013-2018	H05.01	garbage and solid waste	Inside	Medium	Negative	1%	Plastic bottles, kids' toys
2013-2018	K01.01	Erosion	Inside	High	Negative	50%	
2007-2012	A04.02.02	non intensive sheep grazing	Inside	Low	Neutral	5.99ha	While the wider site is grazed by sheep, the grazers do not appear to spend significant time in the wetland area. The area is maintained due to its natural wetness, which prevents succession.
2007-2012	G05.01	Trampling, overuse,	Inside	Low	Neutral	5.99ha	

Mon. period	Future Prospects Notes
2013-2018	The two main threats to the continued presence of Vertigo angustior at Dog's Bay is overgrazing by cattle (affected 85% of the site) and erosion (particularly within the hollow that supports the snail). Interestingly, Moorkens & Killeen (2011) note that sheep grazing was occurring, which is known to result in vegetation being too short to be suitable for Vertigo angustior. However, at this site, the change to cattle grazing has not resulted in a less over-grazed habitat. Erosion has caused the loss of dune habitat (e.g. the area containing samples points 2 and 3 of Moorkens & Killeen (2011) has been washed away) and resulted in the installation of rock armour. The construction of a concrete track adjacent to the positive sample site is also an important impact. Other relatively lesser impacts include trampling by humans, campfires and dumping of rubbish. Based on the above threats and impacts, the Future Prospects of the site are considered to be Unfavourable Inadequate (amber).
2007-2012	As the influence of current management is neutral, Future prospects have been assessed as Favourable . Although this is a very small area of habitat, if the quality is maintained the snail has a good chance of survival

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Green	Red	Amber	Red
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2013-2018	While the Population Assessment for the site remains Favourable, the Future Prospects are Unfavourable Inadequate and the Habitat Assessment is Unfavourable Bad due to the effects of overgrazing and erosion. This results in an Overall Assessment of Unfavourable Bad (red).
2007-2012	

6. DISCUSSION

Monitoring period
2013-2018

Vertigo angustior monitoring at Dog's Bay

Area of occupancy: The habitat that supports Vertigo angustior within this site is the fixed dune habitat along the eastern side of Dog's Bay. Access is from the car park at the north of the site.

Discussion:

Although the habitat suitability status of the only polygon at this site remains unchanged at Suboptimal-Unsuitable, the site has decreased in quality since the 2007-2012 monitoring period. This is evident by a comparison with previous photographs taken at individual sample points. There is now very little Ammophila arenaria across the entire site, where previously large stands were present. The vegetation is very short throughout the site (i.e. ≤3 cm), with large areas with open sand/blown sand. There is little or no thatch anywhere. One small area (S06) is fenced and is the only place with Ammophila arenaria in fixed dune, indicating that overgrazing is a problem. The snail continues to survive in a small hollow, but this is showing signs of damage from erosion, putting the future survival of the species at this site at risk.

Monitoring recommendations:

Given the small area of occupancy and habitat of Vertigo angustior, and the low abundance of the snail, it is recommended that monitoring is carried out at a minimum of three-yearly intervals. This should be re-assessed in light of any deterioration of condition or any changes to site management. Monitoring should follow that of Moorkens & Killeen (2011):

- Describe habitat and take at least 2 samples from the most suitable habitat in the hollow (site 5 of 2009 survey) and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in the at least 5 other locations within the polygon and analyse for molluscan composition
- Re-determine boundary of the habitat polygon and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

NOTE: **Due to the very restricted area in which the snail is found, sampling should be carried out in a sensitive manner and snails should not be removed from the site unless strictly necessary.**

Management recommendations:

The fences on this site have collapsed in a number of places, allowing cattle free range across the Vertigo angustior habitat, which has resulted in overgrazing. These fences should be repaired, and the level of grazing reduced to one which allows the build-up of Festuca rubra litter, with sparse Ammophila arenaria tussocks. Of particular concern is the erosion and damage to the hollow that is known to support Vertigo angustior. This area should be protected immediately from further damage. This may include fencing off and also the planting of Ammophila arenaria along the seaward edge of the hollow in order to stabilise the substratum. It is understood that there had been management interventions at this site in the past. All efforts should be made to re-connect with the landowners/managers to ensure that a mutually agreeable management regime can be put in place immediately.

Vertigo angustior monitoring at Dog's Bay

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior within this site is the fixed dune habitat along the eastern side of Dog's Bay. Access is from the car park at the north of the site.

Discussion:

Vertigo angustior is found in a very small area of habitat. As the Stelfox 1906 record for the species is noted from "Dog's Bay" and is not more specific with regard to habitat, it is difficult to tell if the snail was once more widespread in the grassland. However, Stelfox (1907) described V. angustior habitat as "coastal marshes" based on his knowledge of the few sites then known, so if he had found the snail in due grassland it was likely he would have included this as habitat for the species. It is likely that the coastal grassland in this area has been heavily cropped for a long time, and the snail has survived in the optimum and stable conditions of the marshy armchair. Any site this small is vulnerable to being lost from an extreme event or accident within such a small area. The site is a cSAC, but V. angustior is not a qualifying interest. This is appropriate due to its small habitat size. However, it is likely to survive if there are no significant changes to the landuse, vegetation management, hydrogeology and hydrology of the area.

Monitoring recommendations:

Given the small area of occupancy and habitat of Vertigo angustior, and the relatively low abundance of the snail, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2012
Methods (see Section 3 of main report for full details)Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Describe habitat and take at least 2 samples from the most suitable habitat in the hollow (site 5 of this survey) and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in the at least 5 other locations within the polygon and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

The V. angustior habitat is not significantly managed by grazing, is not mown and is essentially managed by wind, trampling by visitors and hydrogeology.

Proposed management prescription for site

The management at Dog's Bay should remain the same as the present, i.e. no grazing management, no mowing, with succession being prevented by the elements rather than active intervention. As with all low management regimes, this needs careful monitoring, particularly as weather patterns may change and occasional intervention such as strimming may be needed in the future.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Fanore

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM09 **County:** Clare

SAC Site Code: 000020 Black Head-Poulsallagh Complex

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	7 July 2017	John Brophy & Maria Long
2007-2012	3 July 2009	Evelyn Moorkens, Ian Killeen & M. Long

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is Festuca rubra, with some Ammophila arenaria, corresponding to SD7 of Rodwell (2000), and Lotus corniculatus, Pilosella officinarum, Trifolium repens, Galium verum, and Euphrasia lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra and Ammophila arenaria, with sparse Galium verum, Pilosella officinarum and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above or with a higher proportion of Trifolium repens, but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

The site at Fanore comprises an extensive dune system, though much of it has been affected by the operation of a caravan park. In the previous monitoring period, the northern section of the site provided the best habitat for Vertigo angustior and had numerous positive sample locations, while the southern section had few positives. The current survey failed to find the snail at any of the sampling locations, indicating a dramatic reduction, or possibly loss, of the Vertigo angustior population at the site. It is evident that overgrazing is impacting the previously suitable habitat in Polygon A, with signs that the rabbit population is having a particular impact on the sward height and development of the much needed Festuca rubra thatch, while cattle grazing is also evident. Extensive rabbit warrens are present where none were noted previously.

A large proportion of the site has been developed as a caravan park, with concrete bases for mobile homes built into the fixed dunes. The caravan park has extended further to the north into the dunes since the 2009 survey, and this issue needs to be tackled. Other features associated with the caravan park are tracks and paths, toilet blocks, and other buildings. While the caravan park has resulted in the loss of fixed dune habitat, much of the area at the south of this site seems to be less suitable for Vertigo angustior due to the presence of a deep moss layer, with limited Festuca rubra, which is likely to be indicative of aging dunes. Nevertheless, further expansion of the caravan park should not take place.

This site needs an immediate re-visit to endeavour to re-find the snail. It also needs an immediate management plan – this should be between NPWS, the owner of the caravan park, the landowner(s) and the people managing the grazing stock (these final three may all be the same person). NPWS should take the lead on this and issues such as the rabbit population; frequency, timing and species of domestic grazer; supplementary feeding; as well as the operation and expansion of the caravan park all need to be included for discussion.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	M 13780 09536	Start point just below top of dune crest.	
End point:	M 13729 09458		
Transect length:	90	**Direction:**	NE-SW
Description:	The transect runs down from a dune crest with Festuca rubra and Ammophila arenaria-dominated fixed dune grassland, onto gentler slopes with shorter Festuca rubra turf towards the coast		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Six samples were taken at various intervals along the transect principally from zones with Optimal and Suboptimal habitat and analysed for their snail composition		

Vertigo angustior monitoring at Fanore

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	M 13778 09534	At break of slope just below high dune crest
End point:	M 13731 09460	Short turf grassland on gentle slope down to shore
Transect length:	90	**Direction:** NE-SW
Description:	The transect runs down from a dune crest with Festuca rubra and marram dominated fixed dune grassland, onto gentler slopes with shorter Festuca turf towards the coast	
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Eight samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition	

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	10.1356	Polygon A status remains Suboptimal and continues to support the most suitable habitat at the site, with fixed dune dominated by Festuca rubra with Ammophila arenaria, though vegetation is short and thatch build-up is sparse over large areas. Rabbit grazing has impacted negatively on the polygon and it is clear that the population has increased since the previous survey.
B	Suboptimal-Unsuitable	23.9896	Polygon B status has been increased from Suboptimal and Unsuitable to Suboptimal. This change is based on interpretation, due to the fact that there is sufficient suitable habitat present, with no indication of broad ecological change.
C	Unsuitable	19.0126	Polygon C status remains Unsuitable as it is heavily impacted by cattle grazing, the caravan site and includes extensive areas of limestone pavement.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal	10.135	Polygon A
B	Sub-optimal with unsuitable areas	23.99	Polygon B
C	Unsuitable	19.01	Polygon C

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1			66 m	24 m		55m		35m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	9m	NA	44m	NA	37m	47m		43m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 Transect 1 (6 samples)							
2013-2018	1	1	11m	0	0	0	Optimal
2013-2018	1	2	20m	0	0	0	Suboptimal
2013-2018	1	3	27m	0	0	0	Suboptimal
2013-2018	1	4	47m	0	0	0	Optimal-Suboptimal
2013-2018	1	5	52m	0	0	0	Suboptimal
2013-2018	1	6	59m	0	0	0	Optimal-Suboptimal
Monitoring period 2007-2012 Transect 1 (8 samples)							
2007-2012	1	1	10.5m	0	0	0	
2007-2012	1	2	13m	0	0	0	

2007-2012	1	3	20.5m	2	0	2
2007-2012	1	4	29m	0	0	1
2007-2012	1	5	38.5m	0	0	0
2007-2012	1	6	46.5m	0	0	0
2007-2012	1	7	54.5m	0	0	2
2007-2012	1	8	58.5m	0	0	0

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 (10 samples)						
2013-2018	01	M 13709 09543	0	0	0	Suboptimal
2013-2018	02	M 13747 09568	0	0	0	Optimal-Suboptimal
2013-2018	03	M 13782 09455	0	0	0	Suboptimal
2013-2018	04	M 13822 09338	0	0	0	Optimal
2013-2018	05	M 13798 09601	0	0	0	Optimal-Suboptimal
2013-2018	06	M 13898 09494	0	0	0	Suboptimal
2013-2018	07	M 13874 09316	0	0	0	Optimal
2013-2018	08	M 13737 09208	0	0	0	Optimal
2013-2018	09	M 13799 08968	0	0	0	Optimal-Suboptimal
2013-2018	10	M 13977 08719	0	0	0	Suboptimal
Monitoring period 2007-2012 (36 samples)						
2007-2012	01	M 14172 08990	0	0	0	
2007-2012	02	M 14118 09020	0	0	0	
2007-2012	03	M 14114 09059	0	0	1	
2007-2012	04	M 14106 09120	0	0	0	
2007-2012	05	M 14107 09123	0	0	0	
2007-2012	06	M 14042 09178	0	0	0	
2007-2012	07	M 13949 09221	0	0	0	
2007-2012	08	M 13965 09301	0	0	0	
2007-2012	09	M 14023 09275	0	0	0	
2007-2012	10	M 14059 09248	0	0	0	
2007-2012	11	M 13847 08546	0	0	0	
2007-2012	12	M 13838 08662	0	0	0	
2007-2012	13	M 13925 08670	0	0	0	
2007-2012	14	M 13989 08712	0	0	0	
2007-2012	15	M 13928 08823	0	0	0	
2007-2012	16	M 13855 09582	0	0	1	
2007-2012	17	M 13883 09572	0	0	0	
2007-2012	18	M 13914 09571	0	0	0	
2007-2012	19	M 13907 09595	0	0	1	
2007-2012	20	M 14030 09574	0	0	0	
2007-2012	21	M 13921 09600	0	0	0	
2007-2012	22	M 13835 09634	0	0	0	

2007-2012	23	M 13821 09605	0	0	1
2007-2012	24	M 13744 09567	0	0	1
2007-2012	25	M 13709 09547	0	0	1
2007-2012	26	M 13744 09466	0	0	1
2007-2012	27	M 13789 09456	0	0	1
2007-2012	28	M 13830 09495	0	0	0
2007-2012	29	M 13914 09503	0	0	0
2007-2012	30	M 13881 09441	0	0	0
2007-2012	31	M 13833 09362	0	0	1
2007-2012	32	M 13969 09357	0	0	0
2007-2012	33	M 14054 09325	0	0	0
2007-2012	34	M 13773 09557	0	0	0
2007-2012	35	M 13772 09556	0	0	1
2007-2012	36	M 13785 09557	0	0	0

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 8 maritime grassland zones (from 0-90m) with Optimal or Suboptimal habitat	No snails present	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 8 maritime grassland zones (from 0-90m) with optimal or sub-optimal habitat	Present in 3 zones	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in 5 other locations (minimum 10 samples) with optimal habitat at the northern part of the site	Vertigo angustior absent	Fail
2007-2012	Presence/Absence	Adult or sub-adult snails are present in 5 other locations (minimum 10 samples) with optimal habitat at the northern part of the site	Present at 9 of the other 18 locations	Pass

Mon. period	Population Notes
2013-2018	In the 2007-2012 monitoring period, the population assessment was Favourable (green), with three out of eight samples on the transect positive for Vertigo angustior, and 12 out of 36 spot samples positive. In the current survey, Vertigo angustior was not recorded on the transect or at any of the 10 spot samples taken across polygons A and B. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment for Fanore is Unfavourable Bad (red).
2007-2012	

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	At least 20m of habitat along the Transect is classed as Optimal AND At least 45m of habitat along the Transect is classed as Suboptimal or better	0m Optimal and 65m is Suboptimal	Fail
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 45m of the transect	55m Optimal wetness	Pass

2007-2012	1	Habitat extent	At least 20 m of habitat along the Transect is classed as Optimal and at least 45m of habitat along the Transect is classed as Sub-Optimal or Optimal	9m is Optimal AND 53m is Sub-Optimal or Optimal	Fail
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 45m of the Transect	47m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	At least 9-11ha of the habitat at the site should be classed as Suboptimal or better	34.1ha classed as Suboptimal	Pass
2007-2012	Habitat extent	At least 9-11 ha of the habitat at the site should be classed as optimal or sub-optimal	10.13 ha classed as sub-optimal	Pass

Mon. period	Habitat Notes
2013-2018	In the monitoring period 2007-2012, Polygon A was classified as Suboptimal, Polygon B as Suboptimal and Unsuitable, and Polygon C as Unsuitable. In the current survey, the only change is the increase in the status of Polygon B to Suboptimal due to interpretation; sufficient suitable habitat is present to justify this status. While suitable habitat is present across much of the site, it is often less than optimal due to rabbit and cattle grazing (Polygon A) or due to the widespread presence of a dense moss layer (Polygon B). The effect of grazing on the development of a Festuca rubra thatch layer is evident at the transect, where no optimal habitat was recorded in the current survey. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Fanore is Unfavourable Inadequate (amber).
2007-2012	

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	35%	Overgrazing occuring, but mainly caused by rabbits
2013-2018	A05.02	stock feeding	Inside	High	Negative	1%	Supplementary feeding of cattle. Localised by extreme damage
2013-2018	E04.01	Agricultural structures, buildings in the landscape	Inside	High	Negative	0.01%	Drinking troughs
2013-2018	G01.02	walking, horseriding and non-motorised vehicles	Inside	High	Negative	3%	Human trampling
2013-2018	G02.08	camping and caravans	Inside	High	Negative	35%	Mobile homes with concrete bases. Has expanded since 2009. Associated tracks and infrastructure
2013-2018	I02	problematic native species	Inside	High	Negative	15%	Bracken and brambles
2013-2018	K02.01	species composition change	Inside	High	Negative	35%	Dunes becoming moss-dominated as they age
2013-2018	K04.05	damage by herbivores (including game species)	Inside	High	Negative	100%	High rabbit population. Some areas grazed very tightly. Population is higher than previous survey
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	18ha	

2007-2012	A05.02	stock feeding	Inside	Low	Negative	1ha	Congregation of cattle around supplementary feeding areas.
2007-2012	G02.08	camping and caravans	Inside	Medium	Negative	22ha	Degradation from trampling paths and desire lines and the footprint of caravans.

Mon. period	Future Prospects Notes
2013-2018	The site at Fanore is being impacted by cattle and rabbit grazing, trampling, the presence and operation of the caravan park, the spread of problematic invasive species (Pteridium aquilinum and Rubus fruticosus) and the succession of the dunes, as mosses now dominate the understorey in places. Rabbits were not identified as a problem in the previous survey but comparison of photographs shows the extensive impact now evident. While there are issues at the site, suitable habitat continues to be found. However action is required to improve the situation and so the Future Prospects for Fanore are considered to be Unfavourable Inadequate (amber).
2007-2012	As the impact is moderate and considerable habitat still remains, Future prospects have been assessed as Unfavourable inadequate

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Red	Amber	Amber	Red
2007-2012	Green	Amber	Amber	Amber

Mon. period	Overall Notes
2013-2018	With a result of Unfavourable Inadequate (amber) for Habitat Assessment and Future Prospects, and Unfavourable Bad (red) for Population Assessment, the Overall Assessment for Fanore is Unfavourable Bad (red).
2007-2012	Unfavourable due to the small extent of suitable habitat, restricted Vertigo angustior distribution and low abundance, and impacts of cattle and the caravan park

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: The habitat that supports Vertigo angustior within this site is the fixed dune and semi-fixed dune habitat, mostly to the north of the caravan site. Access is from the track through the caravan site and the track to the houses at the north end of the site.

Discussion:

The site at Fanore comprises an extensive dune system, though much of it has been affected by the operation of a caravan park. In the previous monitoring period, the northern section of the site provided the best habitat for Vertigo angustior and had numerous positive sample locations, while the southern section had few positives. The current survey failed to find the snail at any of the sampling locations, indicating a dramatic reduction, or possibly loss, of the Vertigo angustior population at the site. It is evident that overgrazing is impacting the previously suitable habitat in Polygon A, with signs that the rabbit population is having a particular impact on the sward height and development of the much needed Festuca rubra thatch, while cattle grazing is also evident. Extensive rabbit warrens are present where none were noted previously.

A large proportion of the site has been developed as a caravan park, with concrete bases for mobile homes built into the fixed dunes. The caravan park has extended further to the north into the dunes since the 2009 survey, and this issue needs to be tackled. Other features associated with the caravan park are tracks and paths, toilet blocks, and other buildings. While the caravan park has resulted in the loss of fixed dune habitat, much of the area at the south of this site seems to be less suitable for Vertigo angustior due to the presence of a deep moss layer, with limited Festuca rubra, which is likely to be indicative of aging dunes. Nevertheless, further expansion of the caravan park should not take place.

This site needs an immediate re-visit to endeavour to re-find the snail. It also needs an immediate management plan - this should be between NPWS, the owner of the caravan park, the landowner(s) and the people managing the grazing stock (these final three may all be the same person). NPWS should take the lead on this and issues such as the rabbit population; frequency, timing and species of domestic grazer; supplementary feeding; as well as the operation and expansion of the caravan park all need to be included for discussion.

Monitoring recommendations:

This is a sizeable site for Vertigo angustior and while issues with over-grazing have been noted it is not clear what has caused the apparent population crash, and so monitoring is recommended yearly until matters are clarified. The monitoring should follow that proposed by Moorkens & Killeen (2011):

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable and wetness as Too wet, Optimal wetness or Too dry
- Take 1 sample each from each of the 8 main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 10 other locations (with a wide geographical spread, and including at least 7 in Polygon A) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

The priority for the Vertigo angustior site at Fanore is to reduce grazing, both cattle and rabbit, to allow the Festuca rubra sward to develop along with the associated litter thatch. Given the apparent population explosion of rabbits and the large areas grazed very tightly, some active management of the population is likely to be necessary to have a beneficial impact. The aim of the grazing management is to create a larger area of optimal habitat dominated by Festuca rubra and Ammophila arenaria with a layer of humid, open structured thatch. Supplementary feeding should also be stopped at the site immediately.

The physical presence of the caravan park including the mobile homes, their concrete bases, tracks and permanent structures (toilet blocks, etc.) has resulted in the loss of habitat, and also brings associated impacts in the form of human trampling. The park is continuing to expand, resulting in the continuing loss of potential Vertigo angustior habitat. This expansion should be halted.

A management plan should be drawn up with the landowner to allow protection the habitats and species of the Fanore dunes - with careful planning and dialogue, this can be done in conjunction with its continued use as a farm and holiday park.

Vertigo angustior monitoring at Fanore

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior within this site is the fixed dune and semi-fixed dune habitat, mostly to the north of the caravan site. Access is from the track through the caravan site to the houses at the north end of the site.

Discussion:

The dune habitat in general and the habitat particularly important to V. angustior could be in much better condition at this site. The eastern slopes of the site have some protruding limestone pavement, and this unusual combination should be managed in a sustainable way. Degradation of habitat around the paths and desire lines and the habitat loss directly by caravans and mobile homes is considerable. The caravan site has sprawled into a wide area, with some caravans occupying the better dune areas towards the sea. Congregation of cattle around supplementary feeding areas has sacrificed some of what would have been good habitat in the past, but this area is now considerably enriched with nutrients.

Monitoring recommendations:

Given the evidence for the unfavourable Condition of the site, in terms of extent of habitat and future prospects, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2012
Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from each of the 8 main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 10 other locations (with a wide geographical spread, and including at least 7 in polygon area A) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

Existing management consists of extensive cattle grazing in polygon A and the north part of polygon C, and management for tourism in the form of a caravan park in the south of polygon C and the west of polygon B.

Proposed management prescription for site

The management of the cattle at the north of the site needs to be managed with care. The site needs to be grazed by cattle with no more than 0.8 livestock units per hectare, and grazing periods should typically be in the spring to autumn periods, with animals removed for the winter. Livestock should be young suckler or mixed age cattle. There should be no supplementary feeding of animals within the Vertigo angustior habitat, with animals removed at the first signs of hunger. If this is not possible then designated sacrificial areas should be retained where the site has already become nutrient enriched, and not moved around to new areas. The exception would be the ring feeder within the limestone pavement area, which should be removed as this habitat combination is rare. There should be no improvement with fertiliser or drainage of any of the habitat area.

The limits of the caravan area should be noted and there should be no expansion into a wider dune area.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Killanley Glebe

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM10 **County:** Sligo

SAC Site Code: 000458 Killala Bay/Moy Estuary

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	17 August 2015	John Brophy & Maria Long
2007-2012	3 June 2009	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present here is marsh, i.e. permanently waterlogged ground on mineral soil, and the ecotone between Festuca rubra and Potentilla anserina wet grassland and the waterlogged marsh. These are not Annex I nor CORINE listed habitats, but they are important in that they support the so called "marsh phase" or inland habitat of Vertigo angustior. The locations of suitable ecotone include Festuca rubra, Potentilla anserina, Iris pseudacorus, Juncus acutiflorus, Carex disticha, Eleocharis palustris, Holcus lanatus, and Lathyrus pratensis communities. This includes ecotones that include the Rodwell categories of M28, MG10 and MG11 (Rodwell, 1991, 1992). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of this unshaded habitat. The habitat falls within the more general habitat of freshwater marsh (GM1) and wet grassland (GS4) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Marsh with transition of ecotone between Festuca rubra and Potentilla anserina wet grassland and waterlogged marsh dominated by Iris pseudacorus and low growing herbs. Vegetation height 20-40cm. Habitat growing on wet to saturated soil covered with a deep layer of mosses and humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 20cm or greater than 40-50cm, or the soil is dry or covered with standing water.
Unsuitable	Not defined

2. SUMMARY:

The site at Killanley was assessed as Favourable (green) in 2007-2012, and maintains that classification in the 2013-2018 monitoring period. The site was split into two polygons after the current survey, due to the clear difference between the open habitat to the north and the wooded area to the south, with the northern polygon classed as Optimal and the southern as Unsuitable. The population and habitat in the northern polygon suggests that the current management regime is ideal for maintaining the site in favourable conservation status. The snail was not been recorded from the southern polygon during surveys in 2006 and 2009 by Moorkens and Killeen, nor in the current 2015 survey.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point: TRANSECT 1 HAS BEEN DROPPED AS HABITAT IS UNSUITABLE

End point:

Transect length: 0 **Direction:**

Description:

Sampling frequency:

TRANSECT: 2 **MONITORING PERIOD:** 2013-2018

Start point: G 26556 24941 Gap in wall filled by 2 pallets

End point: G 26590 24879 Bank of stream

Transect length: 72 **Direction:** As for 2007-2012

Description: As for 2007-2012

Sampling frequency: As for 2007-2012

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	G 26498 24828	from a tree by the wall by the road opposite a roadsign	
End point:	G 26521 24845	stream	
Transect length:	32	**Direction:**	SW-NE
Description:	The transect runs down a flush slope dominated by tall Iris marsh		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Three samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition		

TRANSECT: 2 **MONITORING PERIOD:** 2007-2012

Start point:	G 26553 24939	From the wall by the road opposite a telegraph pole	
End point:	G 26589 24874	The far bank of a stream	
Transect length:	73.3	**Direction:**	NW-SE
Description:	The transect runs down a flush slope dominated by Iris marsh		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Four samples were taken as above.		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	0.8843	Polygon A - Original polygon split in two (due to southern section, Polygon B, never having supported the snail, and having been planted with trees). Polygon A is classed as Optimal.
B	Unsuitable	0.4227	Polygon B - Original polygon split in two (due to southern section, Polygon B, never having supported the snail, and having been planted with trees). Polygon B is classed as Unsuitable.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
	Sub-optimal with optimal areas	1.465	All of the potential (Optimal and sub-optimal) habitat was contained within one polygon area of 1.465 ha..

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1								
2	41m	8m	14m		9m	55m	13m	4m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	3.7m	NA	16.8m	NA	11.5m	20.7m	8m	3.3m
2	63.3m	NA		NA	10m	65m	3.4	4.9

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 Transect 2 (4 samples)								
2013-2018	2	1	21m	10	1	11	Count	Optimal
2013-2018	2	2	33m	21	0	21	Count	Optimal
2013-2018	2	3	41m	7	0	7	Count	Optimal-Suboptimal
2013-2018	2	4	57m	2	0	2	Count	Optimal-Suboptimal
Monitoring period 2007-2012 Transect 1 (3 samples)								

2007-2012	1	1	13m	0	0	0
2007-2012	1	2	20m	0	0	0
2007-2012	1	3	27m	0	0	0
Monitoring period 2007-2012 Transect 2 (4 samples)						
2007-2012	2	1	26.5m	0	0	31
2007-2012	2	2	35m	0	0	43
2007-2012	2	3	43m	0	0	5
2007-2012	2	4	54m	0	0	0

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 (1 sample)						
2013-2018	01	G 26515 24843	0	0	0	Unsuitable

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	2	Density	At least 2 samples on Transect 2 should have >10 V. angustior individuals	2 samples with >10 individuals	Pass
2013-2018	2	Presence/Absence	Adult or sub-adult snails are present in 3 of the 4 zones on Transect 2 with optimal or sub-optimal habitat	Present in 4 zones	Pass
2007-2012	2	Density	At least 2 samples on Transect 2 should have >10 V. angustior individuals	2 samples with >10	Pass
2007-2012	2	Presence/Absence	Adult or sub-adult snails are present in 3 of the 4 zones on Transect 2 with optimal or sub-optimal habitat	Present in 3 zones	Pass

Mon. period	Population Notes
2013-2018	In the monitoring period 2007-2012, three out of eight samples taken across two transects were positive, with no positive samples recorded on Transect 1 (out of three taken). The current survey recorded Vertigo angustior at all four sample locations on Transect 2, with no snails recorded from one sample taken in the area of Transect 1. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment for Killanley Glebe is Favourable (green).
2007-2012	The main area of the habitat at the site appears to be in good condition for V. angustior

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	2	Habitat extent	>50m of habitat along the Transect is classed as Optimal	48m Optimal or Optimal-Suboptimal (Pass awarded for this criterion, based on expert judgement and overall good quality of site)	Pass
2013-2018	2	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for >50m of the Transect	55m is Optimal wetness	Pass
2007-2012	2	Habitat extent	>50m of habitat along the Transect is classed as Optimal	57.3m is Optimal	Pass
2007-2012	2	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for >50m of the Transect	57.3m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail

2013-2018	Habitat extent	At least 0.8ha of the site dominated by Suboptimal habitat or better (area reduced to take account of polygon split)	0.8843ha Optimal	Pass
2007-2012	Habitat extent	At least 1.4 ha of the site dominated by optimal and sub-optimal habitat	1.43 ha Opt/Sub-opt	Pass

Mon. period	Habitat Notes
2013-2018	In the 2007-2012 monitoring period, one habitat polygon was drawn at Killanley Glebe and classed as Optimal and Sub-optimal. The snail has not been recorded in the part of the polygon which is south of the stream, and this area is now classed as unsuitable habitat as it has been planted with trees. For this reason, the polygon was divided following the current survey, with the southern polygon classed as Unsuitable and the northern polygon classed as Optimal. For a similar reason, Transect 1 has been dropped from the monitoring regime at this site. Note that a length of 50m along the transect needs to be classed as Optimal for one habitat criterion, yet 48m of Optimal habitat was measured in this survey. Given the good overall status and condition of this site, expert judgement was used to assess this particular criterion as a pass. Based on the criteria of Moorkens & Killeen (2011), and taking into account the above changes, the Habitat Assessment for Killanley Glebe is Favourable (green).
2007-2012	the snail is widespread in the wetland area and is locally common

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.02.01	non intensive cattle grazing	Inside	High	Positive	60%	Cattle grazing appears at optimal level
2013-2018	A04.02.02	non intensive sheep grazing	Inside	Medium	Neutral	60%	Unlikely that sheep graze much in wettest areas
2013-2018	B01	forest planting on open ground	Inside	High	Negative	15%	Willows, alders etc planted along river bank
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Low	Neutral	<1.4	The cattle grazing is, at present, having a neutral impact on the quality of the habitat
2007-2012	E01.03	dispersed habitation	Outside	Low	Negative	1ha	There has been a spread of one-off housing in the vicinity of the site, and although no changes in hydrogeology have been evident, some building work is still underway and future plans for housing should be investigated to ensure that any works does not impinge on the groundwater flow towards or out of the site.

Mon. period	Future Prospects Notes
2013-2018	The Future Prospects for Killanley Glebe for the monitoring period 2007-2012 were classed as Favourable (green). Current activities affecting the site include tree planting (southern polygon), and non-intensive cattle and sheep grazing across 60% of the site. Given the extent of suitable habitat at the site, the grazing level appears to be appropriate to maintaining the habitat for the species. The Future Prospects for Killanley Glebe are classed as Favourable (green).
2007-2012	As the impact is low, Future prospects have been assessed as Favourable (green).

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Green	Green	Green	Green
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2013-2018	Based on the results of the Population Assessment, Habitat Assessment and Future Prospects, the Overall Assessment for Killanely Glebe is Favourable (green).

2007-2012

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the wet Iris pseudacorus marsh habitat next to the old graveyard at Killanley Church, on the road between Ballina and Inishcrone.

Discussion:

The site at Killanley Glebe was assessed as Favourable (green) in 2007-2012, and maintains that classification in the 2013-2018 monitoring period. The site was split into two polygons after the current survey, due to the clear difference between the open habitat to the north and the wooded area to the south, with the northern polygon classed as Optimal and the southern as Unsuitable. The population and habitat in the northern polygon suggests that the current management regime is ideal for maintaining the site in favourable conservation status. The snail was not been recorded from the southern polygon during surveys in 2006 and 2009 by Moorkens & Killeen, nor in the current 2015 survey.

Monitoring recommendations:

It is recommended that monitoring is carried out at a minimum of three-yearly intervals. This should be re-assessed in light of any deterioration of condition or any changes to site management. Monitoring is based on that of Moorkens & Killeen (2011):

- Repeat Transect 2, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable., and Too dry, Optimal wetness or Too wet, respectively (Note that Transect 1 has been dropped at this site)
- Take 1 sample each from each of the 4 main zones with the most suitable habitat on Transect 2 and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

The current management of the Vertigo angustior habitat in Polygon A at Killanley Glebe appears ideal for supporting the species and should continue unchanged. The snail has not been found in the southern polygon, in spite of surveys in 2006, 2009 and 2015. This fact, combined with the recent planting of trees in this polygon, means that no management recommendations are being made for this area as it is unlikely to result in the creation of habitat suitable for supporting Vertigo angustior.

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the wet Iris marsh habitat next to the old graveyard at Killanley Church, on the road between Ballina and Inishcrone.

Discussion:

The Condition of the site and the feature based upon the 2009 survey has been assessed as Favourable.

The marsh habitat at Killanley Glebe is of enormous interest as it has remained intact over a long period, and is an important historic site with records of V. angustior dating back to Warren (1879), where she describes finding the snail in the "marshy meadow" of the glebe. There are flushing seepages within the marsh habitat, thus while the saturated ground may receive a significant contribution from rainwater on occasions, the reason why the species is supported is due to the lack of flooding. There is an abundance of Iris marsh in Ireland resulting from pockets of low lying ground, but this marsh is continually flushing from a high spring area down slope, keeping the V. angustior habitat area saturated but not inundated. This is a rare occurrence in Ireland and should be carefully protected.

The groundwater profile in the site appears to be complex and has not been investigated in detail by a hydrogeologist. Therefore caution needs to be taken in local development that may occur outside the site to ensure it is appropriately assessed for potential influences on the Killanley Glebe site.

Monitoring recommendations:

Due to the importance of this site for Vertigo angustior, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the short to medium term. This site should also form part of a suite of important flora and fauna sites for long term surveillance studies in anticipation of potential effects of climate change.

It is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2012
Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 2, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from each of the 4 main zones with the most suitable habitat on the transect T2 and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Additional surveillance at 6 yearly intervals:

Frequency: Next monitoring due 2015
Methods (see Section 3 of main report for full details). Prescription as follows:
- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take at least 1 sample each from each of the main zones with the most suitable habitat on the transect T1 and analyse for molluscan composition

Management recommendations:

The management discussed by Moorkens (2007b) based upon the 2006 survey is repeated below with minor modifications.

Existing Management

The V. angustior habitat has been divided for the purposes of this report into three management units. These are wall and fence divisions that separate the units on a permanent basis. Within these units are some smaller divisions but these have not been closed off in recent times. During the survey period (March and April 2006) there were 10 cattle in total seen in the main habit area Polygon A. The old graveyard and ruined church, supports some V. angustior habitat and it is not managed by grazing. The area to the south of the stream (location of Transect 1) is fenced off and had not had grazing prior to the 2006 survey.

Proposed management prescription for site

The management at Killanley should remain the same as the present regimes within each management unit for the 2009-2012 period. For the main area of habitat in polygon A, this works out a total of 10 cattle. This is somewhat higher density than normally recommended for V. angustior, but the reason is that the habitat for the snail is a small part of the large site, and the cattle do not appear to go into the wettest areas. It is important for this type of extensive grazing that the cattle are removed from the site at very dry times; as such conditions would encourage the cattle to congregate at the wet V. angustior habitat. It is better to restrict grazing to spring and autumn, but if there is a need for summer grazing a temporary electric fence could be placed beyond the sensitive area. The site on the south side of the stream should be monitored to ensure it is not being encroached by scrub in the absence of grazing, but it

is likely to be maintained by wetness in the foreseeable future, indeed it is likely that its wet nature is the reason why it has been fenced off from cattle. The graveyard has some patches of suitable V. angustior habitat among the spaces around the old grave areas and needs no management.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Lahinch

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM11 **County:** Clare

SAC Site Code: 000036 Inagh River Estuary

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	15-16 August 2016	John Brophy & Maria Long
2007-2012	2 July 2009	Ian Killeen & Maria Long

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). There is also habitat within the ecotone of Potentilla anserina grassland between the fixed dunes and the estuary. The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is Festuca rubra, with some Ammophila arenaria, corresponding to SD7 of Rodwell (2000), and Lotus corniculatus, Pilosella officinarum, Trifolium repens, Galium verum, and Euphrasia lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra and Galium verum, Anacamptis pyramidalis and low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above or with a higher proportion of tall grasses, but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

This is a large site which, although consisting of two heavily used golf courses, has supported a population of Vertigo angustior for at least 100 years (and probably very much longer). Until the current survey, the species was found to be relatively widespread and common at the site. However, in 2016 a dramatic decrease was seen, with only 1 out of 15 samples positive. The reasons are unclear, as management does not appear to have changed. The site was inundated by the sea in 2010, but while it is difficult to be certain, the impact of this event on the population is unlikely to have been massive (due to relatively short inundation duration, and the height of many of the dune hills above the level of the inundation). A repeat survey is needed immediately to investigate the population further, and both the golf course managers and NPWS need to meet to discuss options for this large and important site.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	R 09358 89294	Double fence post between course and saltmarsh. (Note correction of grid reference letter from 'M' to 'R'.	
End point:	R 09356 89276	Edge of green	
Transect length:	20	**Direction:**	NE-SW
Description:	As for 2009		
Sampling frequency:	As for 2009		

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	M 09369 89291	By double fence posts at base of slope in saltmarsh transition	
End point:	M 09355 89275	On edge of 7th green	
Transect length:	19.7	**Direction:**	NE-SW
Description:	The transect runs up a relatively steep dune slope from the saltmarsh transition of the estuary to the golf hole by the old castle tower.		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Five samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition		

4. RESULTS

Vertigo angustior monitoring at Lahinch

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	19.0596	Polygon A status remains Optimal-Suboptimal. Within this polygon there are large areas which are unsuitable (e.g. greens), large areas which are too rank, but also multiple smaller patches of good quality. These are scattered throughout the polygon.
B	Suboptimal	0.7426	Polygon B status drops from Optimal and Suboptimal, to Suboptimal. This is a small polygon, portions of which are fixed dune of moderate quality (though with quite a high proportion of rank grasses in places), and portions of which are unsuitable saltmarsh and embryonic dune. (There may have been mapping errors in the original survey resulting in the inclusion of the latter habitat types). The change in status reflects the existence of unsuitable habitat within the polygon, as well as a slight decline in habitat quality (picked up at and near the transect).
C	Suboptimal-Unsuitable	22.454	Polygon C retains status of Suboptimal-Unsuitable. There are some areas with good habitat in larger and higher areas of 'rough' at the western end, but otherwise this is a heavily managed golf course.
D	Suboptimal-Unsuitable	18.3034	Polygon D status increased from Unsuitable to Suboptimal-Unsuitable. This polygon was increased in status as small areas of potential habitat were noted, mostly at the north near the depot. Otherwise, this is area is heavily managed, with either very short grass or quite rank areas. This change is considered one of interpretation rather than ecological change.
E	Suboptimal-Unsuitable	1.5829	Polygon E status remains the same, at Suboptimal-Unsuitable. Small area of 'rough', with a good amount of Festuca rubra. However, there is only a low cover of thatch. Herb cover is high.
F	Suboptimal-Unsuitable	34.2666	Polygon F status increased from Unsuitable, to Suboptimal-Unsuitable. This consists of a large area of golf course, with some areas similar to Polygon E. However, there are small areas with better thatch. This change is considered one of interpretation rather than ecological change.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal with optimal areas	19.06	Polygon A
B	Sub-optimal with optimal areas	0.743	Polygon B
C	Sub-optimal with unsuitable areas	22.454	Polygon C - golf course mostly fairways
D	Unsuitable	18.303	Polygon D - golf course mostly fairways
E	Sub-optimal with unsuitable areas	1.583	Polygon E
F	Unsuitable	35.85	Polygon F - new golf course

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	6 m	6.5m	2.5m	3 m	2 m	20m		

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	11.8m	NA	2.8m	NA	5.1m	19.7m		

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 Transect 1 (4 samples)								
2013-2018	1	1	1.5m	0	0	0		Optimal
2013-2018	1	2	12m	1	0	1	Presence/Absence	Optimal
2013-2018	1	3	16m	0	0	0		Optimal-Suboptimal
2013-2018	1	4	19m	0	0	0		Optimal
Monitoring period 2007-2012 Transect 1 (5 samples)								
2007-2012	1	1	1.5m	0	0	14		
2007-2012	1	2	9m	0	0	2		

2007-2012	1	3	13.5m	0	0	2
2007-2012	1	4	16m	0	0	0
2007-2012	1	5	19m	0	0	1

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 (11 samples)						
2013-2018	01	R 09379 88935	0	0	0	Suboptimal
2013-2018	02	R 09603 88594	0	0	0	Optimal
2013-2018	03	R 08891 88711	0	0	0	Optimal
2013-2018	04	R 08786 88710	0	0	0	Optimal-Suboptimal
2013-2018	05	R 08800 88848	0	0	0	Optimal-Suboptimal
2013-2018	06	R 09137 89021	0	0	0	Optimal-Suboptimal
2013-2018	07	R 08943 88536	0	0	0	Optimal
2013-2018	08	R 09115 88283	0	0	0	Optimal-Suboptimal
2013-2018	09	R 09204 88449	0	0	0	Optimal-Suboptimal
2013-2018	10	R 09275 88915	0	0	0	Optimal-Suboptimal
2013-2018	11	R 09381 87936	0	0	0	Optimal
Monitoring period 2007-2012 (23 samples)						
2007-2012	01	M 09117 89000	0	0	1	
2007-2012	02	M 09116 88942	0	0	0	
2007-2012	03	M 09019 88856	0	0	4	
2007-2012	04	M 09020 88749	0	0	7	
2007-2012	05	M 08970 88705	0	0	3	
2007-2012	06	M 08992 88654	0	0	1	
2007-2012	07	M 09110 88550	0	0	0	
2007-2012	08	M 09113 88470	0	0	0	
2007-2012	09	M 09120 88459	0	0	0	
2007-2012	10	M 09140 88384	0	0	0	
2007-2012	11	M 09121 88300	0	0	0	
2007-2012	12	M 09029 88335	0	0	0	
2007-2012	13	M 08900 88446	0	0	12	
2007-2012	14	M 08792 88650	0	0	12	
2007-2012	15	M 08817 88694	0	0	2	
2007-2012	16	M 08781 88758	0	0	13	
2007-2012	17	M 08844 88860	0	0	1	
2007-2012	18	M 09013 89018	0	0	1	
2007-2012	19	M 09283 89001	0	0	0	
2007-2012	20	M 09375 88920	0	0	2	
2007-2012	21	M 09313 89223	0	0	0	
2007-2012	22	M 09339 89198	0	0	0	
2007-2012	23	M 09367 89286	0	0	1	

5. CONDITION ASSESSMENT

Vertigo angustior monitoring at Lahinch

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 4 zones with optimal or sub-optimal habitat (sample 4 zones)	Present in 1 zone	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 4 zones with optimal or sub-optimal habitat (sample 4 zones)	Present in 3 zones	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in 5 or more other locations (50%, and minimum 10 samples) with optimal habitat at the northern and north-western part of the site	Vertigo angustior absent	Fail
2007-2012	Presence/Absence	Adult or sub-adult snails are present in 5 or more other locations (50%, and minimum 10 samples) with optimal habitat at the northern and north-western part of the site	Present at 13 of the other 23 locations	Pass

Mon. period	Population Notes
2013-2018	In the 2007-2012 monitoring period, the Population Assessment was Favourable (green), with four out of five samples on the transect positive for Vertigo angustior, and 13 out of 23 spot samples positive. In the current survey, only one of the four samples on the transect was positive, and all eleven spot samples were negative. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment for Lahinch is Unfavourable Bad (red).
2007-2012	the snail is widespread in the northern part of the site and is locally common

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	At least 10m of habitat along the Transect is classed as Optimal AND At least 14m of habitat along the Transect is classed as Sub-Optimal or Optimal	12.5m Optimal or Optimal-Suboptimal AND 14m Suboptimal or above	Pass
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 15m of the Transect	20m is optimal wetness	Pass
2007-2012	1	Habitat extent	At least 10m of habitat along the Transect is classed as Optimal and At least 14m of habitat along the Transect is classed as Sub-Optimal or Optimal	11.8m is Optimal, 14.6m is Sub-Optimal or Optimal	Pass
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 15m of the Transect	19.7m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	At least 18ha of the site optimal and sub-optimal	19.8ha	Pass
2007-2012	Habitat extent	At least 18 ha of the site optimal and sub-optimal	19.8 ha	Pass

Mon. period	Habitat Notes
2013-2018	Suitable habitat is patchy due to almost the entire area of the site being managed as a golf course. Moorkens & Killeen (2011) mention that the site has been managed as a golf course since 1892, so clearly the snail is able to tolerate this and survive in some areas. The 2016 survey confirmed that there are suitable habitat patches throughout the site. Some are, however, a little rank, with high cover of grasses like Dactylis glomerata and Arrhenatherum elatius. Other areas are mown or trampled a little too much, so that Festuca rubra thatch build-up is inhibited. The largest areas with the most optimal

2013-2018	habitat are found in areas with highest dune hills - at the north-west and west of the site. In the monitoring period 2007-2012, polygons A and B were classified as Optimal and Suboptimal. In the current survey, Polygon B drops in status to Suboptimal. This is based on ecological changes noted at and near the transect, but also because of the inclusion of areas of unsuitable saltmarsh (possibly due to a mapping error in the previous survey, but retained here nonetheless). Polygons C and E were previously classified as Suboptimal and Unsuitable, and retain this classification. Polygons D and F were classed by Moorkens & Killeen (2011) as Unsuitable, but in the current survey they have been recorded as Suboptimal-Unsuitable as potentially suitable, though small, areas of habitat were seen. In spite of the changes noted above, particularly in Polygon B, the conditions along the transect satisfy the assessment criteria of Moorkens & Killeen (2011), and there is enough potentially suitable habitat across the site as a whole, and so the Habitat Assessment results for Lahinch are Favourable (green).
2007-2012	Much of the habitat at the site appears to be in good condition for V. angustior

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Low	Negative	1%	Grazing level prevents thatch build up.
2013-2018	G02.01	golf course	Inside	Medium	Negative	65%	Presence of golf course (& associated maintenance) reduces habitat area for snail
2013-2018	H05.01	garbage and solid waste	Inside	Low	Negative	10%	Lots of small plastic rubbish at southwest end; the result of sea flooding
2013-2018	L08	inundation (natural processes)	Inside	High	Negative	20%	2010 sea floods covered areas of the golf course
2007-2012	G02.01	golf course	Inside	Medium	Neutral	97ha	Nearly all of the Vertigo angustior habitat lies within Lahinch Golf Club courses. At present, the snail is being maintained by wetness (salt marsh transition area polygon B), and by trampling and limited goat grazing in the golf course rough.

Mon. period	Future Prospects Notes
2013-2018	There are a number of factors affecting the Vertigo angustior habitat at Lahinch. In some areas, management is too intensive to allow the development of suitable habitat, and in others (mainly golf course 'roughs'), lack of management is resulting in rank vegetation. The site was inundated by the sea to a significant degree in storms in 2010. The impact of this event on the population is hard to ascertain, but is unlikely to have been massive (due to relatively short inundation duration, and height of many dune hills above inundation level). No sign of the previously recorded goat grazing was seen. Considering these impacts along with the severe decrease in the population of Vertigo angustior at the site, the Future Prospects for Lahinch are considered to be Unfavourable Inadequate (amber).
2007-2012	At present, the snail is being maintained by wetness (salt marsh transition area polygon B), and by trampling and limited goat grazing in the golf course rough. This should be sustainable for the population if the current amount of rough is maintained.

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Red	Green	Amber	Red
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2013-2018	In spite of a Habitat Assessment of Favourable (green), the Population Assessment of Unfavourable Bad (red) for this site results in an Overall Assessment of Unfavourable Bad (red).
2007-2012	

6. DISCUSSION

Monitoring period

Vertigo angustior monitoring at Lahinch

2013-2018

Area of occupancy: The habitat that supports Vertigo angustior within this site is the fixed dune and semi-fixed dune habitat, mostly in the northern part of the old golf course, and in the saltmarsh to dune transition by the estuary. Access is from the main road.

Discussion:

This is a large site that, although consisting of two heavily used golf courses, has supported a population of Vertigo angustior for at least 100 years (and probably very much longer). Prior to the current survey, the species was found to be relatively widespread and common at the site. However, in 2016 a dramatic decrease was seen, with only 1 out of 15 samples positive. The reasons are unclear, as management does not appear to have changed. The site was inundated by the sea in 2010, but while it is difficult to be certain, the impact of this event on the population is unlikely to have been massive (due to relatively short inundation duration, and the height of many of the dune hills above the level of the inundation). A repeat survey is needed immediately to investigate the population further, and both the golf course managers and NPWS need to meet to discuss options for this large and important site.

Monitoring recommendations:

This is a sizeable and important site for Vertigo angustior. It has been known to support a good population of the species for over a hundred years. It is not clear what has caused the apparent population crash, and so monitoring is recommended yearly until matters are more clear. The monitoring should follow that proposed by Moorkens & Killeen (2011):

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable,and Too Wet, Optimal wetness or Too dry, respectively
- Take 1 sample each from each of the 4 main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 10 other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

Some areas of 'rough' would benefit from increased trampling or introduction of grazing, as the vegetation is too rank for Vertigo angustior. These areas are particularly found in the 'old course', to the west of the road, and within this, mostly at the western fringe. The fact that the area is managed as a golf course may mean that this option is impractical, and so other methods of opening up the vegetation may need to be employed, such as cutting or purposeful disturbance. In areas that need to be opened up or would benefit from trampling, creative use of temporary fencing to funnel walkers/golfers through certain parts of the course could be employed. This should be monitored carefully to avoid unintentional damage to habitat, and designed with specialist advice and input. Other areas of rough, on the other hand, could be mowed less - both in frequency and height. This would allow an increase in thatch build-up.
The use of herbicides, fertiliser, etc. should be strictly limited to fairways/greens, and strong precautions taken to avoid drift (e.g. using covered machines).

Removal of sand; dumping/storage of earth, sand, grass, cuttings, etc.; – all such activities should be carried out away from habitat which is suitable for Vertigo angustior.

The presence of goats on the course was noted by Moorkens & Killeen (2011), but no signs of presence or activity were seen in the 2016 survey.

Given the sudden and large decrease in the population of the target species, the golf course managers and NPWS staff should meet in the near future to discuss the conservation issues and challenges at this important site, and to decide on management actions.

Vertigo angustior monitoring at Lahinch

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior within this site is the fixed dune and semi-fixed dune habitat, mostly in the northern part of the old golf course, and in the saltmarsh to dune transition by the estuary. Access is from the main road

Discussion:

The Condition of the site and the feature based upon the 2009 survey has been assessed as Favourable. The targets have been passed for all performance indicators.

Vertigo angustior was widespread and locally common in the fixed dune areas along the coastal and estuary margins of the old golf course (west side of the main road). The southern and eastern parts of the course support very little suitable V. angustior habitat. Most of the habitat on the new golf course (on the east side of the road) is unsuitable for V. angustior apart from the estuary margins and a more fixed mound at the north end of the site. The golf course management sacrifices some intensively managed areas in return for well managed rough areas, which are currently enough to sustain the snail. Major changes to the course should not be undertaken without consideration of the consequences for the habitat.

Monitoring recommendations:

Although the overall condition of the site is classed as Favourable, given that much of the good habitat lies within the golf club, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2012
Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from the 4 main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 10 other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

The site has been managed as a large links golf course since 1892 and the snail has had a sustainable population within the rough areas and salt marsh transition. The rough areas and the salt marsh are unmanaged apart from a small number of goats that wander extensively over the course.

Proposed management prescription for Vertigo angustior

The existing management is recommended to be continued with no further intensification of the current rough areas or salt marsh transition.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Malin Dunes

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM12 **County:** Donegal

SAC Site Code: 002012 North Inishowen Coast

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	8-9 June 2016	John Brophy & Maria Long
2007-2012	6 July 2009	Evelyn Moorkens & Maria Long

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is Festuca rubra, with some Ammophila arenaria, corresponding to SD7 of Rodwell (2000), and Lotus corniculatus, Pilosella officinarum, Trifolium repens, Galium verum, and Euphrasia lower down the slope, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra and Ammophila arenaria, with sparse Galium aparine, Pilosella officinarum and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above or with a higher proportion of Trifolium repens, but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

This site represents an extensive area of Vertigo angustior habitat, most of which is in good condition and suitable for supporting the species. Monitoring criteria based heavily on the 60m transect have resulted in an Overall Assessment of Unfavourable Bad (red). However, this result should be interpreted in the context of the site as a whole, which is both in good condition more or less throughout, and likely to continue to be so (particularly following discussion with landowner who has no plans to change farming practices).

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	C 42507 53038	1m from eroded edge above beach	
End point:	C 42524 52993		
Transect length:	60	**Direction:**	As for 2009
Description:	As for 2009		
Sampling frequency:	As for 2009		

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	C 42498 53036	Top of dune ridge	
End point:	C 42526 52985	Top of north facing dune slope	
Transect length:	60	**Direction:**	NW-SE
Description:	The transect runs across undulating Festuca rubra dominated fixed dune grassland, from a high dune crest through hollows and up slopes including north and south facing slopes.		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Seven samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment

Vertigo angustior monitoring at Malin Dunes

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	31.7243	Polygon A status increased from Optimal and Suboptimal in 2007-2012 to Optimal in the current survey. There was abundant suitable habitat within the polygon. There was not enough data available to determine whether this change is ecological or due to interpretation.
B	Suboptimal	21.3526	Polygon B was reclassified from Suboptimal and Unsuitable in 2007-2012 to Suboptimal in the current survey. Many areas are very mossy with limited Festuca rubra thatch, but are nonetheless capable of supporting Vertigo angustior. There is not enough data available to determine whether this change is ecological or due to interpretation.
C	Suboptimal-Unsuitable	14.8201	Polygon C was upgraded from Unsuitable to Suboptimal-Unsuitable. Large areas are unsuitable due to flooding (dune slack), tight grazing and species change due to agricultural use; however, one of the dune ridges is suitable for supporting Vertigo angustior and the species was found there. It is unknown whether this change in status is due to ecological change or interpretation.
D	Suboptimal	11.5052	Polygon D was upgraded from Unsuitable to Suboptimal due to the area of habitat present capable of supporting Vertigo angustior. While lower areas are unsuitable due to agriculture (grazed tight, with agricultural species or damaged by supplementary feeding), higher ground had more suitable habitat of Ammophila arenaria tussocks with Festuca rubra thatch. It is unknown whether this change in status is due to ecological change or interpretation. The area of the polygon was reduced, as the church and graveyard were excluded from the polygon.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal with optimal areas	31.724	Polygon A
B	Sub-optimal with unsuitable areas	21.353	Polygon B
C	Unsuitable	14.82	Polygon C
D	Unsuitable	12.568	Polygon D

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	31.5m	22m	6.5m			43m		17m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	42m	NA	13	NA	5m	55m		5m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 Transect 1 (6 samples)								
2013-2018	1	1	1m	0	0	0		Optimal
2013-2018	1	2	20m	1	0	1	Presence/Absence	Optimal
2013-2018	1	3	25m	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	1	4	35m	1	0	1	Presence/Absence	Optimal
2013-2018	1	5	45m	1	0	1	Presence/Absence	Optimal
2013-2018	1	6	52m	0	0	0		Optimal
Monitoring period 2007-2012 Transect 1 (7 samples)								
2007-2012	1	1	10m	0	0	0		
2007-2012	1	2	14.5m	0	0	1		
2007-2012	1	3	17.5m	0	0	0		
2007-2012	1	4	22m	0	0	0		
2007-2012	1	5	29.5m	0	0	1		

2007-2012	1	6	41m	0	0	2		
2007-2012	1	7	52m	0	0	0		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 (8 samples)							
2013-2018	01	C 42536 52818	0	0	0		Optimal
2013-2018	02	C 42566 52551	1	0	1	Presence/Absence	Optimal
2013-2018	03	C 42748 53298	0	0	0		Optimal-Suboptimal
2013-2018	04	C 42913 53132	1	0	1	Presence/Absence	Optimal
2013-2018	05	C 43005 52639	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	06	C 42923 52267	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	07	C 42849 51975	0	0	0		Optimal
2013-2018	08	C 42568 52145	1	0	1	Presence/Absence	Optimal
Monitoring period 2007-2012 (18 samples)							
2007-2012	01	C 42534 53188	0	0	0		
2007-2012	02	C 42538 53178	0	0	0		
2007-2012	03	C 42562 53155	0	0	0		
2007-2012	04	C 42572 53117	0	0	0		
2007-2012	05	C 42567 53082	0	0	0		
2007-2012	06	C 42591 53056	0	0	1		
2007-2012	07	C 42454 52471	0	0	0		
2007-2012	08	C 42654 52344	0	0	0		
2007-2012	09	C 42677 52391	0	0	0		
2007-2012	10	C 42722 52409	0	0	0		
2007-2012	11	C 42750 52487	0	0	0		
2007-2012	12	C 42740 52638	0	0	0		
2007-2012	13	C 42456 53205	0	0	0		
2007-2012	14	C 42498 53140	0	0	1		
2007-2012	15	C 42517 53068	0	0	1		
2007-2012	16	C 42541 53002	0	0	1		
2007-2012	17	C 42519 52359	0	0	1		
2007-2012	18	C 42572 52141	0	0	1		

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 8 maritime grassland zones (from 0-60m) with optimal or sub-optimal habitat	Present in 5 zones	Pass
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 8 maritime grassland zones (from 0-60m) with optimal or sub-optimal habitat	Present in 3 zones	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present at 3	Present at 5 other locations (8	Pass

2013-2018		other locations (minimum 6 sites sampled) with optimal or sub-optimal habitat	sampled)	Pass
2007-2012	Presence/Absence	Adult or sub-adult snails are present at 3 other locations (minimum 6 sites sampled) with optimal or sub-optimal habitat	Present at 6 other locations (from 18 sampled)	Pass

Mon. period	Population Notes
2013-2018	In the monitoring period 2007-2012, Vertigo angustior was recorded at five out of seven locations on the transect, and six out of 18 other locations around the site. This gave an overall result of 36% positive samples. In the current survey, five out of six locations on the transect were positive for Vertigo angustior, while five out of eight other locations across the site were positive. This gives an overall result of 71% positive samples. Among the 2016 samples were positive samples from both polygons C and D, which were previously deemed Unsuitable. All of this points to a healthy and widespread population of Vertigo angustior at this site. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Favourable (green).
2007-2012	the snail is scattered in its distribution and present in rather low numbers

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	At least 40m of habitat along the Transect is classed as Optimal AND At least 55m of habitat along the Transect is classed as Sub-Optimal or Optimal	32m is Optimal AND 60m is Suboptimal or Optimal	Fail
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 55m of the Transect	43m is Optimal wetness	Fail
2007-2012	1	Habitat extent	At least 40m of habitat along the Transect is classed as Optimal and At least 55m of habitat along the Transect is classed as Sub-Optimal or Optimal	44m is Optimal, 55m is Sub-Optimal or Optimal	Pass
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 55m of the Transect	55m is optimal	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	At least 30-35ha of the site sub-optimal with optimal areas	65.4ha Suboptimal or above	Pass
2007-2012	Habitat extent	At least 30-35 ha of the site sub-optimal with optimal areas	31.7 ha	Pass

Mon. period	Habitat Notes
2013-2018	All habitat polygons at this site were upgraded in suitability status, with most areas being Suboptimal or better. This means that large areas across this site hold significant areas of land which provide good habitat for Vertigo angustior. In fact this site is likely to hold some of the largest expanses of Vertigo angustior habitat in the country. However, in spite of this, based on the criteria of Moorkens & Killeen (2011), the habitat assessment for Malin Dunes is Unfavourable Bad (red). This is because their assessment relies heavily on large proportions of the transect remaining optimal.
2007-2012	much of the habitat at the site appears to be in good condition for V. angustior

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Low	Positive	75%	Very low numbers of cattle
2013-2018	A04.02.02	non intensive sheep grazing	Inside	Medium	Positive	100%	Levels of sheep grazing across site as whole are beneficial to habitat

2013-2018	A05.02	stock feeding	Inside	High	Negative	2%	Supplementary feeding only in Polygon D. Quite damaging in small areas.
2013-2018	D01.01	paths, tracks, cycling tracks	Inside	Low	Negative	1%	Farmer access
2013-2018	I02	problematic native species	Inside	High	Negative	5%	Few areas at west (polygons B and C) affected by bracken
2013-2018	K01.01	Erosion	Inside	High	Negative	10%	Severe erosion in northern part of Polygon A. Much land lost.
2007-2012	A04.02.02	non intensive sheep grazing	Inside	Medium	Negative	27.39ha	The sheep grazing is cropping the vegetation to a level that is unsuitable for V. angustior, but it is not known whether the lack of habitat is solely due to grazing or whether the wetness levels are unsuitable also. Currently the sheep remain in the polygons that are unsuitable and are not affecting the quality of the habitat in polygons A and B. If they were to spread into A and B the result would be negative.

Mon. period	Future Prospects Notes
2013-2018	The Future Prospects for Vertigo angustior at Malin Dunes were classed as Favourable (green) in the monitoring period 2007-2012, with non-intensive sheep grazing the only noted activity (which was deemed negative). The current survey noted non-intensive sheep and cattle grazing as positive, as it is maintaining a more open sward, preventing the site from becoming rank with Ammophila arenaria tussocks. It was noted that there is a good balance of grazing - some areas are grazed a little too tight, some are a little rank, but on balance, across the site as a whole, the grazing regime is well-suited to providing good habitat for Vertigo angustior. Considerable erosion is occurring around the seaward edge of the northern half of the site, which has resulted in loss of habitat. This is notable in particular at the start point of the transect, which is now much closer to the edge of the dune, as well as through the remnants of a former car park (concrete and tarmacadam), which are scattered at the end of the road to the beach. This will continue to be a concern into the future, with impacts probably increasing with continuing climate change. However, mitigating against this is the large size of the site. Other impacts include supplementary feeding, the spread of bracken, and some minor paths & tracks. Based on the generally positive (or if negative, then limited in extent) activities on-going at the site, the Future Prospects for Malin Dunes are assessed as Favourable (green).
2007-2012	As the impact is not impinging on the areas needed to sustain the snail, Future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Green	Red	Green	Red
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2013-2018	In the monitoring period 2007-2012, the overall assessment for Malin Dunes was Favourable (green). Despite favourable results for the Population Assessment and Future Prospects, and the improved classification of all four polygons, the Unfavourable Bad result for Habitat Assessment means an Overall Assessment of Unfavourable Bad (red).
2007-2012	

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: Vertigo angustior habitat is present throughout much of the fixed dune system known as the Back Strand or Lag. Access is from the minor road that turns off to the church at Lag at C 432 526.

Discussion:

This site represents an extensive area of Vertigo angustior habitat, most of which is in good condition and suitable for supporting the species. Monitoring criteria based heavily on the 60m transect have resulted in an Overall Assessment of Unfavourable Bad (red). However, this result should be interpreted in the context of the site as a whole, which is both in good condition more or less throughout, and likely to continue to be so (particularly following discussion with landowner who has no plans to change farming practices).

Monitoring recommendations:

As this is such an important site for the species, monitoring should be carried out at three-yearly intervals to ensure that no major changes occur to the site, particularly in terms of the management activities or on-going (natural) erosion. The monitoring should follow that proposed by Moorkens & Killeen (2011), with only minor changes as suggested below:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too dry, Optimal wetness or Too wet, respectively
- Take 1 sample each from at least 6 of the 8 main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of eight other locations (with a wide geographical spread, and including from all four polygons) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

Generally, the grazing levels at the site are ideal (particularly within polygons A, B and C). Some areas are grazed tight, others to an ideal level and some are a little rank, but with a site this size the balance is as good as is likely to be achieved. Polygon D should be less heavily grazed, and the supplementary feeding should either be ceased, or moved to areas outside the Vertigo angustior habitat. Erosion rates at the site need to be monitored, and an assessment of coastal defence options may be needed in the future.

Vertigo angustior monitoring at Malin Dunes

2007-2012

Area of occupancy: Vertigo angustior habitat is present throughout much of the fixed dune system known as the Back Strand or Lag. Access is from the minor road that turns off to the church at Lag at C 432 526.

Discussion:

The future sustainability of V. angustior at Lag dunes depends on the continued vegetation height at Polygons A and B. These areas have widespread marram grass with a wide variety of other dune species, and are not encroached by the sheep grazing to the east of the site in spite of that fact that there are no boundary fences to prevent them mover over the entire site. The V. angustior habitat is less fixed and the marram grass dominating the area may be less tempting to sheep than the softer grass of the lower ground inland. The snail habitat is managed by exposure and this appears to be enough to prevent it getting more rank and unsuitable. Therefore, the likelihood of a sustainable population surviving in the future is high.

Monitoring recommendations:

Although the Condition of the site, both in terms of habitat and Vertigo angustior distribution and abundance was Favourable, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2013
Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 6 of the 8 main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

There was no evidence of any grazing in 2009 in polygons A and B, but sheep were grazing polygons C and D. The habitat where V. angustior is present has no active management, and thus is managed by exposure, i.e. the frequent high winds and rain.

Proposed management prescription for site

As the population of the snail is being maintained by the current regime, no change is proposed from the current management.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Pollardstown Fen

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM13 **County:** Kildare

SAC Site Code: 000396 Pollardstown Fen

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	18-19 September 2014	John Brophy & Maria Long
2007-2012	12 May 2009	Evelyn Moorkens and Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present here in different areas is grassland marsh transition, grassland pond transition, or grassland marsh fen transition, but in each case permanently waterlogged but not inundated ground on mineral soil, mostly the ecotone between Potentilla anserina dominated wet grassland and the Iris marsh. These are not Annex I nor CORINE listed habitats, but they are important in that they support the so called "marsh phase" or inland habitat of Vertigo angustior. The habitat at the eastern site is more suitable for the snail than the site below the graveyard, and locations of suitable ecotone include combinations of Potentilla anserina, Iris pseudacorus, Carex paniculata, Carex acutiformis, Triflium pretense, and Ranunculus repens communities. This comprises ecotones that include the Rodwell categories of M28, MG10 and MG11 (Rodwell, 1991, 1992). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of this unshaded habitat. The habitat falls within the more general habitat of freshwater marsh (GM1) and wet grassland (GS4) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Iris marsh and wet grassland with Potentilla anserina, Carex paniculata, Carex acutiformis at the fen margin, with an open structured, damp, humid thatch of decaying vegetation with living and decaying moss in the litter layer of this unshaded habitat
Sub-optimal	As above but habitat is more shaded or with Filipendula, or thatch and moss layer is sparse, or there is pools of standing water
Unsuitable	Not defined

2. SUMMARY:

This site has seen a considerable deterioration in terms of its suitability for Vertigo angustior in the period between 2009 and 2014. Polygon A has become rank and overgrown (not to mention overshadowed by growing trees), to such an extent that it is hard to imagine it ever having been suitable for Vertigo angustior. Polygons B and D are overgrazed, and for the most part lack areas with a suitable thatch/moss layer to host the species. The species was found in only one sample point, within Polygon C. Management intervention is urgently needed to attempt to reverse the deterioration. Polygon A needs some targeted tree removal and immediate instigation of grazing, whereas Polygons B and D need a relaxation of grazing in general, and perhaps also some fencing out of animals from lower parts at wet times of year. Overall, the prospects for the species at this site are poor. The area of potentially suitable habitat at the site has always been very limited, and given the deterioration in quality across most of its area, for a variety of reasons, the species has been put under significant pressure.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	N 76774 61571	Approx 1 m east of leaning Salix fragilis.	
End point:	N 76740 15856	Carex paniculata tussocks. Rank.	
Transect length:	30	**Direction:**	As for 2007-2012
Description:	As for 2007-2012		
Sampling frequency:	As for 2007-2012		

TRANSECT: 2 **MONITORING PERIOD:** 2013-2018

Start point:	N 77795 15220	2nd fence post SE of gate. Broken off at base.	
End point:	N 77789 15208	Spoil heap. End point on slope down to SW.	
Transect length:	12	**Direction:**	As for 2007-2012
Description:	As for 2007-2012		
Sampling frequency:	As for 2007-2012		

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	N 76729 15801	From a small willow tree	
End point:	N 76743 15847	The end of the sedge fen	
Transect length:	30	**Direction:**	S-N
Description:	The transect runs through a transition from wet grassland to Iris marsh to sedge fen		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Three samples were taken at various intervals along the transect from optimal and sub-optimal habitat, and analysed in the laboratory for their snail composition		

TRANSECT: 2 **MONITORING PERIOD:** 2007-2012

Start point:	N 77794 15239	From the second fence post east of the gate	
End point:	N 77790 15218	A mound (spoil heap)	
Transect length:	12	**Direction:**	N-S
Description:	The transect runs from the fence to the main fen across an Iris transition marsh and up a slope into rough cattle pasture		
Sampling frequency:	As for Transect 1. Two samples were taken at various intervals along the transect from optimal and sub-optimal habitat, and analysed in the laboratory for their snail composition		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal-Unsuitable	0.6139	Polygon A status was downgraded from Sub-optimal to Suboptimal-Unsuitable. The boundary was tweaked slightly to ensure transect located within polygon.
B	Suboptimal	0.1175	Polygon B status remains Suboptimal. The boundary was refined to better delineate the habitat. Grassland to south excluded.
C	Suboptimal-Unsuitable	0.7792	Polygon C status was downgraded from Sub-optimal to Suboptimal-Unsuitable. The boundary was altered slightly to better delineate the habitat.
D	Suboptimal-Unsuitable	0.788	Polygon D status was downgraded from Sub-optimal to Suboptimal-Unsuitable.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal	0.5911	Polygon A - transition from wet grassland to Iris marsh to sedge fen
B	Sub-optimal	0.1534	Polygon B - small area of Iris marsh between the fen and rough cattle grazed slope
C	Sub-optimal	0.7866	Polygon C - small area of Iris marsh between the fen and rough cattle grazed slope
D	Sub-optimal	0.788	Polygon D - small area of Iris marsh between the fen and rough cattle grazed slope

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1				19.5 m	10.5m	19.5m		10.5m
2			4m	1.5 m	6.5m	4m		8m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	11m	NA	12.5m	NA	6.5m	30m		
2	3.6m	NA	3m	NA	5.4m	6.6m		5.4m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 Transect 1 (3 samples)							

2013-2018	1	1	14m	0	0	0	Suboptimal-Unsuitable
2013-2018	1	2	18.5m	0	0	0	Suboptimal-Unsuitable
2013-2018	1	3	26.5m	0	0	0	Suboptimal-Unsuitable
Monitoring period 2013-2018 Transect 2 (1 sample)							
2013-2018	2	1	2.5m	0	0	0	Suboptimal
Monitoring period 2007-2012 Transect 1 (3 samples)							
2007-2012	1	1	7.3m	0	0	0	
2007-2012	1	2	12.4m	0	0	1	
2007-2012	1	3	18.5m	0	0	5	
Monitoring period 2007-2012 Transect 2 (2 samples)							
2007-2012	2	1	2.8m	0	0	2	
2007-2012	2	2	5.4m	0	0	3	

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 (4 samples)						
2013-2018	01	N 77712 15262	0	0	0	Suboptimal-Unsuitable
2013-2018	02	N 77611 15287	0	0	0	Suboptimal-Unsuitable
2013-2018	03	N 78014 15061	0	0	0	Suboptimal-Unsuitable
2013-2018	04	N 77836 15208	1	0	1	Suboptimal-Unsuitable
Monitoring period 2007-2012 (1 sample)						
2007-2012	01	N 77782 15227	0	0	4	

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in at least 1 sample taken from Optimal or Sub-optimal habitat on Transect 1 (minimum 3 samples)	Adult or sub-adult snails absent from Transect 1 (3 samples)	Fail
2013-2018	2	Presence/Absence	Adult or sub-adult snails are present in at least 1 sample taken from Optimal or Sub-optimal habitat on Transect 2 (minimum 2 samples)	Adult or sub-adult snails absent from Transect 2 (1 sample only - disturbed by horses)	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in at least 1 sample taken from Optimal or Sub-optimal habitat on Transect 1 (minimum 3 samples)	V. angustior found in 2 of the 3 samples	Pass
2007-2012	2	Presence/Absence	Adult or sub-adult snails are present in at least 1 sample taken from Optimal or Sub-optimal habitat on Transect 2 (minimum 2 samples)	Found in 2 samples	Pass

Mon. period	Population Notes
2013-2018	The population of Vertigo angustior at Pollardstown Fen appears to have deteriorated, as it was only found at one sample location as compared to five in 2007-2012. The species was not found on either transect in the current study. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Unfavourable Bad (red).
2007-2012	the snail is scattered in its distribution and present in rather low numbers

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red))

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	At least 20 m of habitat along Transect 1 is classed as Sub-Optimal or Optimal AND Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 20 m of Transect 1	0 m of habitat along Transect 1 is classed as Suboptimal or Optimal AND Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 19.5 m of Transect 1	Fail
2013-2018	2	Habitat extent	At least 6 m of habitat along Transect 2 is classed as Sub-Optimal or Optimal AND Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 6 m of Transect 2	4 m of habitat along Transect 2 is classed as Sub-Optimal or Optimal AND Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 4 m of Transect 2	Fail
2007-2012	1	Habitat extent	At least 20m of habitat along Transect 1 is classed as Sub-Optimal or Optimal and Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 20m of Transect 1	23.5m is Sub-Opti/Optimal and 30m optimal wetness	Pass
2007-2012	2	Habitat extent	At least 6m of habitat along Transect 2 is classed as Sub-Optimal or Optimal and Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 6m of Transect 2	6.6m is Sub-Opt/Optimal and 6m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	At least 2ha of the site sub-optimal with optimal areas	0.15ha Suboptimal	Fail
2007-2012	Habitat extent	At least 2 ha of the site sub-optimal with optimal areas	2.32 ha Sub-optimal	Pass

Mon. period	Habitat Notes
2013-2018	There is not sufficient suitable habitat present on the transects or in the site as a whole. Only Polygon B remains unchanged from 2007-2012, with polygons A, C and D all dropping from Sub-optimal to Suboptimal-Unsuitable. Polygon A is now rank with no suitable vegetation. Polygon C has limited Iris pseudacorus marsh, and this is very grassy. In Polygon D, the grassland is too dry, while the drain is too wet, leaving extremely limited areas of suitable moisture for Vertigo angustior.
2007-2012	The habitat at the site is extremely small in area and much of it is not in good condition for V. angustior due to grazing pressure

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.02.03	non intensive horse grazing	Inside	Low	Negative	60%	
2013-2018	A04.03	abandonment of pastoral systems, lack of grazing	Inside	High	Negative	40%	Lack of grazing
2013-2018	A08	Fertilisation	Inside	Medium	Negative	15%	
2013-2018	H05.01	garbage and solid waste	Inside	Low	Negative	1%	

2013-2018	J02.02	Removal of sediments (mud...)	Inside	High	Negative	2%	Pool dug out around spring.
2007-2012	A04.02.01	non intensive cattle grazing	Inside	High	Negative	1.7ha	Although the number of cattle is relatively low, because the area of V. angustior habitat is extremely small, the intensity within the habitat is high.

Mon. period	Future Prospects Notes
2013-2018	The two main activities impacting on Vertigo angustior habitat in Pollardstown Fen are lack of grazing (A04.03) and non-intensive horse grazing (A04.02.03). As the Vertigo angustior habitat is found in small areas across a number of management units, different activities can be limited to certain areas only. In the case of lack of grazing, this impact is most notable in polygons A and parts of C, the most westerly and easterly polygons, respectively. No grazing is evident in these areas and this is impacting negatively on the Vertigo angustior habitat. In contrast to the areas affected by lack of grazing, grazing by horses in polygons B and D is having the opposite effect, if less severe. While this grazing is acting to keep the vegetation open, as required by Vertigo angustior, the levels appear to be slightly too high, resulting in a lack of thatch and some poaching. Moorkens & Killeen (2011) assessed the Future Prospects as Unfavourable Inadequate (amber), with non-intensive cattle grazing (A04.02.01) posing a risk to the habitat in the longer term, which must be addressed to prevent the Future Prospects dropping to Unfavourable Bad (red). Whether as a direct result of the identification of this problem by Moorkens & Killeen (2011), or as a result of unrelated changes to management by the landowners, the threat is now from lack of grazing (polygons A and C) and overgrazing/trampling by horses (polygons B and D). Small areas of habitat capable of supporting Vertigo angustior continue to occur in Pollardstown Fen, but the quality of this habitat has declined since the 2009 survey. The only positive sample at the site was in Polygon C. The Future Prospects are assessed as Unfavourable Bad (red).
2007-2012	Overall for the site the impact has been assessed as moderate rather than severe, therefore Future prospects have been assessed as Unfavourable inadequate (amber). However, unless the grazing is urgently addressed, the impact would have to be assessed as severe.

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Red	Red	Red	Red
2007-2012	Green	Green	Amber	Amber

Mon. period	Overall Notes
2013-2018	Based on the limited distribution of Vertigo angustior at Pollardstown Fen, the deterioration of the habitat and the poor Future Prospects, the overall assessment for the site is Unfavourable Bad (red).
2007-2012	

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: As in 2007-2012, the habitat that supports Vertigo angustior is the ecotone above the fen margin below the esker ridge at the south east of the fen, and the small mineral marsh in the centre south of the fen. Access is through private property or the public entrance.

Discussion:

This site has seen a considerable deterioration in terms of its suitability for Vertigo angustior in the period between 2009 and 2014. Polygon A has become rank and overgrown (not to mention overshadowed by growing trees), to such an extent that it is hard to imagine it ever having been suitable for Vertigo angustior. Polygons B and D are overgrazed, and for the most part lack areas with a suitable thatch/moss layer to host the species. The species was found in only one sample point, within Polygon C. Management intervention is urgently needed to attempt to reverse the deterioration. Polygon A needs some targeted tree removal and immediate instigation of grazing, whereas polygons B and D need a relaxation of grazing in general, and perhaps also some fencing out of animals from lower parts at wet times of year. Overall, the prospects for the species at this site are poor. The area of potentially suitable habitat at the site has always been very limited, and given the deterioration in quality across most of its area, for a variety of reasons, the species has been put under significant pressure.

Monitoring recommendations:

Monitoring should be carried out largely following Moorken & Killeen (2011) and on a three-yearly basis. Due to the very limited

distribution of the species at the site, it is recommended that the proposed inclusion of polygons C and D in the monitoring on a six-yearly basis be changed to three-yearly.

Assessment of the transect and other locations with spot sampling, plus assessment of condition of polygon. Prescription as follows:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable, and Too Dry, Optimal wetness or Too wet, respectively
- Take 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Repeat Transect 2, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too dry, Optimal wetness or Too wet, respectively
- Take 1 sample each from at least 2 of the main zones with the most suitable habitat on the Trasnect 2 and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Describe habitat and take 2 samples from the most suitable habitat in each of polygons C and D and analyse for molluscan composition
- Use results to determine overall condition assessment

Management recommendations:

The Vertigo angustior habitat in Pollardstown Fen is largely limited to the transition zone between drier and wetter habitats and, as such, is very limited in extent. For polygons B and D, the negative effect of grazing by cattle, identified by Moorkens & Killeen (2011), has been replaced by the negative effect of grazing by horses. A similar solution is recommended, namely that electric fences be used to temporarily exclude animals from the lower end of the fields and the ponds during dry periods when they may congregate in the wetter zone, which supports Vertigo angustior. The moss and litter layer is sensitive to poaching and grazing and a balance needs to be struck to maintain the habitat is a condition favourable to Vertigo angustior, particularly as the areas are very small. Given that the habitat is currently grazed extremely tightly, fencing off is needed immediately. However, it is important that the areas are not abandoned, as should the habitat become rank, this will also have a negative effect on its suitability for Vertigo angustior.

In Polygon C, a strip in the lower part of the field is currently being managed extensively (i.e. no overgrazing or poaching). The only positive sample at the site was found in a small area in the west of Polygon C. No change is recommended for the management of this polygon.

Polygon A is suffering from a lack of grazing, resulting in the vegetation becoming rank and too dense for V.ertigo angustior. Growth of trees and shrubs has also resulted in levels of shading beyond the tolerance of Vertigo angustior. In order to bring this area back to good condition, an appropriate level of grazing is required and some targeted scrub/tree control or removal is also likely to be needed. Grazing by goats and cattle was noted by Moorkens & Killeen (2011) and local landowners suggested that feral goats used to occur, but are no longer present. The reintroduction of cattle and/or goats is required to maintain the habitat and the effect of this should be monitored to ensure that the right stocking/grazing level is achieved. The management of this small area will be difficult, as it is isolated and the surrounding managed lands are separated by a fence and treeline. Nonetheless, action is required immediately to attempt to restore the habitat quality.

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior is the ecotone above the fen margin below the esker ridge at the south east of the fen, and the small mineral marsh in the centre south of the fen. Access is through private property or the public entrance.

Discussion:

Vertigo angustior was first discovered at Pollardstown Fen in 2002, and was the subject of a survey of the entire fen margin during that year. This showed that the snail was found only in the transition zone lying between the sloping grazed grassland with herbs, and the wetter fen dominated by Filipendula ulmaria, Juncus spp., and grasses. The transition zone was fragmented and discontinuous, and rarely more than 3-4 metres wide. The habitat within the zone was characterised principally by stands of Iris pseudacorus with grasses (e.g. Holcus lanatus and Phleum pratense), and low-growing herbs, particularly Potentilla anserina and Ranunculus repens. The survey demonstrated that the distribution of Vertigo angustior at Pollardstown Fen is very restricted, apparently only occurring at the south-eastern end of the site over a distance of approximately 800 metres, in a zone mostly less than 4 metres wide, and in a small clump of Iris dominated vegetation below the graveyard. Within the latter site, V. angustior is only occasionally found to be present, suggesting it is restricted to a very small areas of micro habitat for the majority of time, spreading more widely (a few metres square) during times of high humidity. The entire habitat for V. angustior at the fen equates to a maximum area of potential occupancy of 2.3 ha, whereas in reality, the area of suitable micro habitat is considerably less.

Transition zone habitat comprising grassland with herbs occurs around most of the fen perimeter. However, the combination of suitable vegetation composition and ground moisture only occurs at a few locations. These are mainly on banks and mounds along the southern perimeter. Throughout most of the northern fen perimeter the transitional grassland is both tall and rank, or the land has been intensively managed up to the fen margin, such that the transition zone is too wet.

There are very few "marsh phase" or inland V. angustior habitat locations known in Ireland. While Iris marsh is very common in the country, this habitat is mainly subject to inundation in winter. Inundated habitat cannot support this species; it requires a wet but free-draining substrate. The combination of high water table and free draining esker ridge at Pollardstown accounts for its rare presence here.

This rare habitat needs to be carefully maintained into the future, especially in the light of its recent trampling damage. This site should therefore be monitored regularly, both for correct management maintenance and to assess other likely impacts caused by increased pressure on the greater Dublin area, and by the consequences of climate change.

Monitoring recommendations:

Given the overall assessment of the Condition of the habitat and the feature of the site as Unfavourable Inadequate, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2012
Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Repeat transect 2, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 2 of the main zones with the most suitable habitat on the transect T2 and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Additional work at 6 yearly intervals:

Frequency: Next monitoring due 2015
Methods (see Section 3 of main report for full details). Prescription as follows:
- Describe habitat and take 2 samples from the most suitable habitat in each of Polygons C and D and analyse for molluscan composition

Management recommendations:

Existing Management

The V. angustior habitat below the graveyard has occasional grazing by cattle during times of movement, and low intensity grazing by goats. The eastern habitat is grazed by cattle, the intensity of grazing can be high at dry times when the animals congregate around the wettest area and nearby ponded water, and this has led to (sometimes severe) poaching of the habitat.

Proposed management prescription for site

The management of the western habitat area in the vicinity of Transect 1 should be maintained for the 2010-2013 period. The occasional grazing by goats and cattle is not poaching the habitat, which itself is maintained by the wetness and transition of mineral to peat soils in the area.

The management of the eastern end in the vicinity of Transect 2 needs to be more carefully controlled. The habitat forms a narrow zone at the base of three large interconnected fields of improved grassland, where the interconnecting gates can be opened or closed. The improved grassland has a high carrying capacity for grazing cattle, and lowering the current intensity is not necessary most of the time. However, in dry periods, the cattle congregate in the important habitat area to gain moisture from the vegetation, and water from the ponds. In order to protect the habitat, the cattle should either be removed during dry periods, or else, more sensibly, the V. angustior habitat should be fenced off using temporary electric fencing during dry periods, leaving one approach to a drinking pond, or else by placing a drinking trough higher in the field. The electric fence should be removed at the end of the dry spell to allow for less intensive periods of grazing of the habitat, where the grazing pattern is more random and suitable for the maintenance of favourable condition.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Streedagh Point Dunes

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM14 **County:** Sligo

SAC Site Code: 001680 Streedagh Point Dunes

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	18-19 August 2015	John Brophy & Maria Long
2007-2012	8 July 2009	Ian Killeen & Evelyn Moorkens

1.2 General Habitat Description (from baseline survey):

The V. angustior habitat at Streedagh is in sand dune habitat along the tombolo formation, the dunes on Conors Island to Streedagh Point, and the dunes at the southern end of the cSAC site. This general habitat in which Vertigo angustior is present corresponds to fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The dominant vegetation is Festuca rubra with Ammophila arenaria, corresponding to SD7 of Rodwell (2000), and Festuca rubra dominated vegetation with Galium verum, Campanula rotundifolia, Euphrasia, Holcus lanatus, Anacamptis pyramidalis, and Plantago lanceolata, corresponding to SD8 of Rodwell (2000). Towards the salt marsh (CORINE 15.3) the snail is found within Iris and Equisetum palustre transition habitat, but not within the salt marsh itself. The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	1. Fixed dune, species-rich grassland dominated by Festuca rubra, with sparse Ammophila arenaria, Geum verum, Pilosella officinarum, Anacamptis pyramidalis, Plantago lanceolata and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch. 2. Transition marsh with Iris, Equisetum palustre, Caltha palustris, Lychnis flos-cuculi, Mentha aquatica (height 25-40cm). Under-storey of moss and litter
Sub-optimal	1. Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure. 2. Vegetation composition as above but either vegetation height is less than 25cm or over 50cm, or the soil is very wet with pools of standing water, or the thatch is wetter with a denser structur
Unsuitable	Not defined

2. SUMMARY:

The site at Streedagh Point supports extensive habitat suitable for supporting Vertigo angustior and the snail was found to be common and widespread. It was assessed as Favourable (green) in 2007-2012, but had an assessment of Unfavourable Inadequate (amber) in the current study due to a relatively small change in quality in the lower part of the transect (based on the habitat criteria set by Moorkens & Killeen (2011)). Given the fact that this is, overall, an excellent site for the species, and continues to support a large population over a large area, and does not suffer from serious negative impacts, it is likely that the assessment result is too negative, and too heavily weighted to conditions on the transect. In terms of the impacts, cattle-grazing is having a positive effect at the current levels, though horse grazing on Conor's Island should be reduced.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	G 63263 50371	High point on the dunes
End point:	G 63423 50428	Edge of the saltmarsh
Transect length:	173	**Direction:** SW-NE
Description:	The transect runs across Festuca rubra dominated fixed dune grassland, from a high dune crest down an undulating slope to transition grassland, into a Iris marsh and then into saltmarsh. The transect crosses a tarmacadam road at 117m distance and runs towards an isolated white post in the water.	
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Seven samples were taken at various intervals along the transect from dune and wetland zones with optimal and sub-optimal habitat, and analysed in the laboratory for their snail composition	

Vertigo angustior monitoring at Streedagh Point Dunes

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	G 63256 50374	High point on the dunes	
End point:	G 63419 50424	Edge of the saltmarsh	
Transect length:	173	**Direction:**	SW-NE

Description: The transect runs across Festuca rubra dominated fixed dune grassland, from a high dune crest down an undulating slope to transition grassland, into a Iris marsh and then into saltmarsh. The transect crosses a tarmacadam road at 117m distance and runs towards an isolated white post in the water.

Sampling frequency: Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Seven samples were taken at various intervals along the transect from dune and wetland zones with optimal and sub-optimal habitat, and analysed in the laboratory for their snail composition

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	46.5367	Polygon A status remains Suboptimal. Large areas not very suitable (grazed heavily by horses), but yet large areas of moderate quality also. Thatch relatively poor through-out, however.
B	Optimal	25.1517	Polygon B was upgraded from Sub-optimal and Unsuitable to Optimal, as large areas of this polygon represent excellent quality Vertigo angustior habitat.
C	Unsuitable	22.7387	Polygon C status remains Unsuitable - largely farmed.
D	Optimal-Suboptimal	31.5039	Polygon D status remains Optimal-Suboptimal. Most of transect is in this polygon. Good quality fixed dune habitat.
E	Suboptimal	3.5784	Polygon E status dropped from Optimal and Sub-optimal to Suboptimal. This was due to the fact that a large portion of this polygon is improved agricultural grassland, and parts of the marsh are very rank. It is unclear whether inclusion of the area of agricultural grassland originally was a mapping error. A small area was added into this polygon at the northern end in 2015, as it is a contiguous area of similar marsh habitat.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal	45.637	Polygon A - unlikely to change
B	Sub-optimal with unsuitable areas	25.512	Polygon B - could improve if dunes became more fixed
C	Unsuitable	22.739	Polygon C - unlikely to improve because of development
D	Sub-optimal with optimal areas	31.504	Polygon D
E	Sub-optimal with optimal areas	3.041	Polygon E

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	71m	12.5m	45m	21.5m	23m	150m	23m	

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	63.5m	NA	85	NA	24.5m	149.5	19	4.5m (road)

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 Transect 1 (7 samples)								
2013-2018	1	1	4m	1	0	1	Presence/Absence	Optimal
2013-2018	1	2	24.5m	1	0	1	Presence/Absence	Optimal
2013-2018	1	3	37m	1	0	1	Presence/Absence	Optimal

2013-2018	1	4	81m	1	0	1	Presence/Absence	Optimal
2013-2018	1	5	96m	0	0	0		Optimal
2013-2018	1	6	132m	75	9	84	Count	Suboptimal-Unsuitable
2013-2018	1	7	146m	22	0	22	Count	Suboptimal-Unsuitable
Monitoring period 2007-2012 Transect 1 (7 samples)								
2007-2012	1	1	8m	0	0	2		
2007-2012	1	2	17.5m	0	0	0		
2007-2012	1	3	32m	0	0	0		
2007-2012	1	4	61m	0	0	23		
2007-2012	1	5	85m	0	0	16		
2007-2012	1	6	130m	0	0	8		
2007-2012	1	7	150m	0	0	6		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 (8 samples)							
2013-2018	01	G 66022 51988	3	1	4	Count	Suboptimal
2013-2018	02	G 66059 52189	6	1	7	Count	Suboptimal
2013-2018	03	G 65981 52262	1	0	1	Presence/absence	Optimal
2013-2018	04	G 65846 51755	51	25	76	Count	Optimal
2013-2018	05	G 65644 51533	1	0	1	Presence/absence	Optimal
2013-2018	06	G 65383 51372	1	0	1	Presence/absence	Optimal
2013-2018	07	G 65142 51171	1	0	1	Presence/absence	Optimal
2013-2018	08	G 64344 50824	1	0	1	Presence/absence	Optimal

5. CONDITION ASSESSMENT

5.1 Population Assessment: 3 passes Favourable (green); 2 pass Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence1	Adult or sub-adult snails are present in 3 out of 5 samples taken on the dune slopes (0-117m)	Present in 4 of the 5 samples from dune habitat	Pass
2013-2018	1	Presence/Absence2	Adult or sub-adult snails are present in 2 samples taken in the wetland habitat from 121.5 to 154m on the transect	Present in both samples from the wetland	Pass
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 3 out of 5 samples taken on the dune slopes (0-117m) ANDAdult or sub-adult snails are present in 2 samples taken in the wetland habitat from 121.5 to 154m on the transect	Present in 4/5 samples from dunes & both wetland	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	Adult or sub-adult snails present in at least 2 samples from both Polygons A and B, minimum 3 samples in each.	Present in 3 of 3 from Polygon A and 4 of 4 from Polygon B	Pass

Mon. period	Population Notes
2013-2018	Streedagh Point Dunes supports a good population of Vertigo angustior in terms of numbers and distribution. The 2007-2012 monitoring recorded positive samples for the species at five out of seven locations on the transect across polygons D and E. More widespread sampling in the current survey recorded the species at six out of seven locations on the transect and eight out of eight samples across polygons A and B. The highest abundance recorded was 84 adults and juveniles in sample T1_06 on the transect. The criteria of Moorkens & Killeen (2011) were limited to the transect and so an additional criterion has been added. The Population Assessment for the site is Favourable (green).

2007-2012	the snail is distributed throughout and present in good numbers

5.2 Habitat Assessment: 6-7 passes Favourable (green); 4-5 passes Unfavourable Inadequate (amber); 0-3 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent1	35m of dune habitat along the first 117m of the Transect is classed as Optimal, 117m is classed as Optimal or Sub-Optimal	71m is Optimal, 116m Optimal or Suboptimal	Pass
2013-2018	1	Habitat extent2	30m of wetland habitat between 121.5m and 154m of the Transect is classed as Optimal or Sub-Optimal	7m is Optimal/Suboptimal	Fail
2013-2018	1	Habitat quality1	Soils, are damp (optimal wetness) with a layer of humid thatch for > 95m of the first 117m of dune habitat	117m is Optimal wetness	Pass
2013-2018	1	Habitat quality2	Soils in the wetland (121.5 to 154m) are optimal wetness and covered with a layer of moss and litter, throughout the zone (32.5m)	28.5m is Optimal wetness	Fail
2007-2012	1	Habitat extent	35m of dune habitat along the first 117m of the Transect is classed as Optimal, 117m is classed as Optimal or Sub-Optimal and30m of wetland habitat between 121.5m and 154m of the Transect is classed as Optimal or Sub-Optimal	Pass on both	Pass
2007-2012	1	Habitat quality	Soils, are damp (optimal wetness) with a layer of humid thatch for > 95m of the first 117m of dune habitat andSoils in the wetland (121.5 to 154m) are optimal wetness and covered with a layer of moss and litter, throughout the zone (32.5m)	Pass on both	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent1	32-36ha of the habitat in areas D and E classed as optimal and sub-optimal	31.5ha Optimal-Suboptimal in D & E	Pass
2013-2018	Habitat extent2	44-46ha of the habitat in area A classed as optimal or sub-optimal	46.5ha Suboptimal	Pass
2013-2018	Habitat extent3	20ha of Polygon B classed as Optimal-Suboptimal or better	25.2ha Optimal	Pass
2007-2012	Habitat extent	32-36ha of the habitat in areas D and E classed as optimal and sub-optimal AND44-46 ha of the habitat in area A classed as optimal or sub-optimal	34.56 ha in D and E and 46.5 ha in A	Pass

Mon. period	Habitat Notes
2013-2018	The habitat suitability of Polygon A remains Suboptimal despite tight grazing by horses. Polygon B is increased from Suboptimal and Unsuitable to Optimal due to the presence of extensive areas of very good quality Vertigo angustior habitat along the length of the polygon. This change is not thought to be ecological, but rather due to a misclassification in the previous monitoring period, as all 5 samples taken in this polygon in 2015 were positive. Polygon C remains Unsuitable, and includes houses and improved agricultural land. Polygon D remains Optimal-Suboptimal, while Polygon E has decreased from Optimal and Suboptimal to Suboptimal due to the presence of areas of improved grassland and to the vegetation here becoming more rank in places (i.e. end of transect), with dense areas of Juncus subnodulosus. Overall, the site contains large areas of suitable habitat. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Streedagh Point Dunes is Unfavourable Inadequate (amber). This is due largely to the final part of the transect being very wet and having vegetation not typical for the species, nor aligning with that defined by Moorkens & Killeen (2011) for the site (i.e. tall, dense and dominated by Juncus subnodulosus rather than fixed dune, or transition marsh with Iris pseudacorus).
2007-2012	Both the dune and wetland habitats at the site are in good condition for V. angustior

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Medium	Positive	70%	Moderate grazing necessary at site
2013-2018	A04.02.03	non intensive horse grazing	Inside	High	Negative	25%	In NE high level of horse grazing - bad
2013-2018	D01.01	paths, tracks, cycling tracks	Inside	Low	Neutral	5%	Small tracks/trails = ok
2013-2018	D01.02	roads, motorways	Inside	Low	Negative	1%	Small roads - small issue
2013-2018	G01.02	walking, horseriding and non-motorised vehicles	Inside	High	Negative	1%	Not much in dunes, but negative where occurs
2013-2018	G05.01	Trampling, overuse,	Inside	Medium	Negative	5%	Very severe at western end of Polygon B
2013-2018	I01	invasive non-native species	Inside	Low	Negative	1%	Sycamore - Isolated, low-growing trees
2013-2018	K01.01	Erosion	Inside	High	Negative	10%	Along edges of Polygon B in particular
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	80ha	Polygon A - Conor's Island 45.6ha ranked moderate to high; Polygons C and D 34.5ha ranked medium to low. Grazing has a greater impact at the eastern end of the site (Area A) but the habitat is naturally sub-optimal, whereas in the more optimal habitat in areas D and E the grazing impact is lower. However, the impact of an increase in grazing in either area would be
2007-2012	G01.03	motorised vehicles	Inside	Medium	Negative	25ha	Polygon B - Driving vehicles on the beach and parking within the dunes in Area B is impacting the habitat but as the habitat is mostly unfixed dune, the impact on V. angustior is less severe.
2007-2012	M01.03	flooding and rising precipitations	Inside	Low	Negative	3-5ha	Rising sea levels are likely to have a major impact on the transition zone in Areas D and E, but in the foreseeable future, the impact is regarded as low.

Mon. period	Future Prospects Notes
2013-2018	The Future Prospects for the site in 2007-2012 were classed as Favourable (green). A number of activities/impacts are occurring at the site which may have a bearing on its suitability for supporting Vertigo angustior. Much of the site is under grazing by cattle and, at the current levels, this is considered to be having a positive impact on the habitat by preventing the vegetation from becoming rank. Despite the continued occurrence of the snail on Conor's Island, horse grazing in this area is high and having a negative effect by creating a tight sward with little build-up of Festuca rubra litter. Erosion has impacted on the dune habitat, particularly on the seaward side of Polygon B. Other impacts mostly relate to recreational use of the site including trampling, tracks and vehicles. On the whole, however, the Future Prospects of Streedagh Point Dunes are considered to be Favourable (green).
2007-2012	Overall, as the impacts are moderate rather than severe, Future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment

2013-2018	Green	Amber	Green	Amber
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2013-2018	Despite the favourable results for the Population Assessment and Future Prospects, the Unfavourable Inadequate (amber) result for the Habitat Assessment results in an Overall Assessment of Unfavourable Inadequate (amber).
2007-2012	

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the fixed dune habitat along the tombolo and at the southern end of the dune system and the marsh in the southern section. Access is from the car park at the south of the site.

Discussion:

The site at Streedagh Point supports extensive habitat suitable for supporting Vertigo angustior and the snail was found to be common and widespread. It was assessed as Favourable (green) in 2007-2012, but had an assessment of Unfavourable Inadequate (amber) in the current study due to a relatively small change in quality in the lower part of the transect (based on the habitat criteria set by Moorkens & Killeen (2011)). Given the fact that this is, overall, an excellent site for the species, and continues to support a large population over a large area, and does not suffer from serious negative impacts, it is likely that the assessment result is too negative, and too heavily weighted to conditions on the transect. In terms of the impacts, cattle-grazing is having a positive effect at the current levels, though horse grazing on Conor's Island should be reduced.

Monitoring recommendations:

Due to the importance of Streedagh Point Dunes as an extensive site supporting Vertigo angustior, it is recommended that monitoring is carried out at three-yearly intervals. This should be re-assessed in light of any deterioration of condition or any changes to site management. Monitoring should follow that of Moorkens & Killeen (2011), with a minor alteration to the number of samples in polygons A and B:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too dry, Optimal wetness or Too wet, respectively
- Take 1 sample each from 5 of the main dune habitat zones (0-117m) with the most suitable habitat on the transect and analyse for molluscan composition
- Take 1 sample each from 2 of the main zones in the Iris marsh habitat (121.5-154m) on the transect and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Describe habitat and take at least 3 samples from the most suitable habitat (with a wide geographical spread) in each of polygon areas A and B, and analyse for molluscan composition
- Use results to determine overall condition assessment

Management recommendations:

It is recommended that cattle grazing at the site be maintained at current levels, as it is having a positive effect on the habitat for the snail. Horse grazing on Conor's Island should be reduced to a level that allows areas of Ammophila arenaria, with Festuca rubra thatch, to develop. Appropriate measures should be implemented to limit the impact of human activities at the site, in particular with regard to vehicles and trampling.

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the fixed dune habitat along the tombolo and at the southern end of the dune system. Access is from the car park at the south of the site.

Discussion:

The Condition of the site and the feature based upon the 2009 survey has been assessed as Favourable. The targets have been passed for all performance indicators. The results obtained in 2009 are very similar to those from 2006 with the vegetation and wetness levels virtually unchanged.

Vertigo angustior was present in moderate numbers to high numbers on the lower dune slopes and in the wetland area. The snail was either rare or absent in the samples from the upper dune slope. There was evidence of an increase in rabbit warrens and rabbit grazing on the dune slopes, and overgrazing by cattle remains a problem on the lower slopes and in the wetland transition.

Monitoring recommendations:

Although the overall assessment of the Condition of the habitat and the feature of the site is Favourable, it is still recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2012
Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from 5 of the main dune habitat zones (0-117m) with the most suitable habitat on the transect and analyse for molluscan composition
- Take 1 sample each from 2 of the main zones in the Iris marsh habitat (121.5-154m) on the transect and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Additional surveillance at 6 yearly intervals:

Frequency: Next monitoring due 2015
Methods (see Section 3 of main report for full details). Prescription as follows:
- Describe habitat and take at least 5 samples from the most suitable habitat (with a wide geographical spread) in each of Polygon areas A and B, and analyse for molluscan composition

Management recommendations:

7.2 Management
Existing Management

The management as described in 2006 is repeated below (with small modifications).

The area has been divided into 5 polygon areas A to E (Figure 1). Area A has been grazed heavily by cattle, and the sward has been tightly cropped and is bare in places. Area B is ungrazed, but heavily trampled and driven on by humans in places. The public car park is between B and C. Area C is not considered to be V. angustior habitat and has been developed for housing in the recent past. Area D is cattle grazed, quite heavily in places. A road separates D and E. There is no fence here, so cattle can graze on the other side of the road into Area E. The habitat of Area E is different from the rest of the site, with a transition zone between grassland and saltmarsh.

Proposed management prescription for site (from 2006 survey)

The management at Streedagh is not ideal for the maintenance of V. angustior in favourable condition. For areas A, D and E, there should be no more than 1 livestock unit per hectare, and grazing periods should typically be in the spring and autumn periods, with animals removed for the winter. Livestock should be young suckler or mixed age cattle. There should be no lowering or intensifying of this regime. There should be no supplementary feeding of animals within the Vertigo angustior habitat. There should be no improvement with fertiliser or drainage of any of the habitat area. There should be no sheep introduced to the site. Area B should be maintained by light public trampling, but cars should be excluded from the area. These management changes should be monitored and maintained from 2009-2012 unless monitoring suggests a further change should take place.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Bartraw

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM15 **County:** Mayo

SAC Site Code: 001482 Clew Bay Complex

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	11 July 2017	John Brophy & Maria Long
2007-2012	21 May 2010	Ian Killeen & Maria Long

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is Festuca rubra, with some Ammophila arenaria, corresponding to SD7 of Rodwell (2000), and Lotus corniculatus, Pilosella officinarum, Trifolium repens, Galium verum, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra, with sparse Ammophila arenaria, Geum verum, and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

The site at Bartraw consists of an isthmus, supporting a narrow strip of dune habitat, connecting to an island that supports abundant fixed dune habitat suitable for supporting Vertigo angustior. The snail was found across much of the island, as well as the northern part of the isthmus, but the dunes further south are too mobile to provide suitable habitat. Some threats and pressures were identified for the site, but all are considered to be relatively small in scale. They include walking/trampling, horse-riding and storm-thrown shingle. Overall, Vertigo angustior is expected to continue to survive at the site. The site would benefit from the removal of horse-riding in the dunes, and a programme of dune restoration to repair damage caused along the isthmus by trampling and blow-outs.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	L 91208 84524	Narrow path along top of crest.
End point:	L 91297 84517	
Transect length:	90	**Direction:** W-E
Description:	The transect runs across undulating Festuca rubra-dominated fixed dune grassland, from a high dune crest , along the base of a north-facing slope to a series of gentle hollows and slopes	
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Five samples were taken at various intervals along the transect principally from zones with Optimal and Suboptimal habitat and analysed for their snail composition	

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	L 91211 84524	Top of dune crest
End point:	L 91296 84517	Eastern end of hollow
Transect length:	90	**Direction:** W-E
Description:	The transect runs across undulating Festuca rubra dominated fixed dune grassland, from a high dune crest , along the base of a north facing slope to a series of gentle hollows and slopes	
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Five samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition	

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	8.8826	Polygon A status remains Optimal-Suboptimal, with extensive suitable habitat consisting of Festuca sward with scattered Ammophila arenaria.
B	Suboptimal-Unsuitable	0.8381	Polygon B status remains Suboptimal-Unsuitable. There has been some loss of habitat due to storm thrown shingle encroaching on the dune habitat, but suitable habitat remains.
C	Unsuitable	2.1575	Polygon C status remains Unsuitable. The dunes here are too mobile, with the sandy substratum resulting in a thatch that lacks moisture.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal with optimal areas	8.809	Main island at northern end - polygon A - good condition could not be improved
B	Sub-optimal with unsuitable areas	0.83	Northern end of isthmus - polygon B - could improve
C	Unsuitable	2.157	Southern end of isthmus - polygon C - heavily damaged, unlikely to recover

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	66m	21m			3m	87m		3m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	87m	NA	1.5m	NA	1.5m	88.5m		1.5m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 Transect 1 (5 samples)								
2013-2018	1	1	6.5m	1	0	1	Presence/Absence	Optimal
2013-2018	1	2	26m	1	0	1	Presence/Absence	Optimal
2013-2018	1	3	39m	1	0	1	Presence/Absence	Optimal
2013-2018	1	4	66m	1	0	1	Presence/Absence	Optimal
2013-2018	1	5	57m	1	0	1	Presence/Absence	Optimal-Suboptimal
Monitoring period 2007-2012 Transect 1 (5 samples)								
2007-2012	1	1	7m	9	2	11		
2007-2012	1	2	19m	18	0	18		
2007-2012	1	3	40m	40	34	74		
2007-2012	1	4	70m	6	1	7		
2007-2012	1	5	85m	5	1	6		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 (8 samples)							
2013-2018	01	L 91126 84358	1	0	1	Presence/Absence	Optimal
2013-2018	02	L 91182 84311	1	0	1	Presence/Absence	Optimal
2013-2018	03	L 91369 84326	0	0	0		Optimal
2013-2018	04	L 91270 84449	1	0	1	Presence/Absence	Optimal
2013-2018	05	L 91371 84624	0	0	0		Optimal
2013-2018	06	L 91261 84573	1	0	1	Presence/Absence	Optimal

2013-2018	07	L 91054 84145	1	0	1	Presence/Absence	Optimal
2013-2018	08	L 90831 83625	0	0	0		Suboptimal
Monitoring period 2007-2012 (16 samples)							
2007-2012	01	L 91100 84332	0	0	1		
2007-2012	02	L 91121 84364	0	0	1		
2007-2012	03	L 91172 84454	0	0	1		
2007-2012	04	L 91264 84576	0	0	1		
2007-2012	05	L 91345 84630	0	0	1		
2007-2012	06	L 91286 84455	0	0	1		
2007-2012	07	L 91283 84364	0	0	1		
2007-2012	08	L 91265 84307	0	0	1		
2007-2012	09	L 91180 84315	0	0	1		
2007-2012	10	L 91058 84219	0	0	1		
2007-2012	11	L 91033 84133	0	0	1		
2007-2012	12	L 90926 83940	0	0	0		
2007-2012	13	L 90923 83927	0	0	0		
2007-2012	14	L 90915 83875	0	0	0		
2007-2012	15	L 90886 83764	0	0	0		
2007-2012	16	L 90774 83516	0	0	0		

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 6 main grassland zones (from 0-90m) with optimal or sub-optimal habitat	Present in 5	Pass
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 3 of the 6 main grassland zones (from 0-90m) with optimal or sub-optimal habitat	Present in all 5 of the zones sampled	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in at least 4 other locations on the island and in one site from the northern end of the isthmus, with Optimal habitat (minimum 6 samples)	Present at 4 other locations on the island and 1 on the isthmus	Pass
2007-2012	Presence/Absence	Adult or sub-adult snails are present in at least 4 other locations on the island and in one site from the northern end of the isthmus, with Optimal habitat (minimum 6 samples)	Present at 9 other locations on the island and 2 on the isthmus	Pass

Mon. period	Population Notes
2013-2018	In the 2007-2012 monitoring period, the population assessment was Favourable (green), all five samples on the transect positive for Vertigo angustior, and 11 out of 16 spot samples were positive. In the current survey, all five samples on the transect were again positive, with five out of eight spot samples also positive. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment for Bartraw is Favourable (green).
2007-2012	the snail is widespread in its distribution and present in relatively high numbers

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	75m of habitat along the Transect is classed as Optimal-Suboptimal or better	87m Optimal-Suboptimal or better	Pass
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (Optimal wetness) and covered with a layer of humid thatch for 75m of the Transect	87m Optimal wetness	Pass
2007-2012	1	Habitat extent	75m of habitat along the Transect is classed as Optimal	87m is optimal	Pass
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for 75m of the Transect	87m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	8-10ha of the site Optimal-Suboptimal or better	8.81ha is Optimal-Suboptimal	Pass
2007-2012	Habitat extent	8-10ha of the site sub-optimal with optimal areas	8.88 ha	Pass

Mon. period	Habitat Notes
2013-2018	Based on the 2007-2012 monitoring survey, Polygon A was Optimal and Suboptimal, Polygon B was Suboptimal and Unsuitable, and Polygon C was Unsuitable. There has been no change to the suitability classifications of the three polygons, though there has been some habitat loss in Polygon B due to storm-thrown shingle covering some areas that were previously dune habitat. The habitat along the transect continues to be predominately Optimal, and a slight change has been made to the target criteria to take account of the application of the 5-point scale now used. Based on the criteria of Moorkens & Killeen (2011) (with the slight change noted), the Habitat Assessment for Bartraw is Favourable (green).
2007-2012	Most of the fixed dune habitat at the site appears to be in good condition for V. angustior

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	G01.02	walking, horseriding and non-motorised vehicles	Inside	High	Negative	2%	Damage caused by walking, and horse manure present
2013-2018	G05.01	Trampling, overuse,	Inside	High	Negative	2%	Tracks created by trampling in dunes
2013-2018	I01	invasive non-native species	Inside	Low	Negative	0.1%	Small sycamore trees in Polygon C
2013-2018	L07	storm, cyclone	Inside	High	Negative	2%	Shingle thrown up into Polygon B, covering dune habitat
2007-2012	G01.02	walking, horseriding and non-motorised vehicles	Inside	Low	Neutral	9.6ha	If trampling pressures became more extreme and climatic changes resulted in inundations of the isthmus, then the situation could deteriorate.
2007-2012	J02.09.01	saltwater intrusion	Inside	Low	Neutral	9.6ha	If climatic changes resulted in inundations of the isthmus, then the situation could deteriorate.
2007-2012	M01.01	temperature changes (e.g. rise of temperature & extremes)	Inside	Low	Negative	9.6ha	If climatic changes resulted in inundations of the isthmus, then the situation could deteriorate.
2007-2012	M01.02	droughts and less precipitations	Inside	Low	Negative	9.6ha	

2007-2012	M01.03	flooding and rising precipitations	Inside	Low	Negative	9.6ha

Mon. period	Future Prospects Notes
2013-2018	Damaging activities or threats to the Vertigo angustior population at Bartraw are limited. There is some walking and limited horse-riding taking place; storms have thrown shingle over potential Vertigo angustior habitat in Polygon B; and there is the occasional small sycamore (Acer pseudoplatanus) tree in Polygon C. Overall, the future of Vertigo angustior at Bartraw appears secure and so the Future Prospects are considered Favourable (green).
2007-2012	As the impacts are low, Future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Green	Green	Green	Green
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2013-2018	Based on the Favourable (green) results for habitat and population assessments and Future Prospects, the Overall Assessment for Bartraw is Favourable (green).
2007-2012	

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: Vertigo angustior habitat is present throughout most of the fixed dune system at the northern part of the isthmus and on the island, but is absent from the unfixed, southern part of the isthmus. Access is from the beach carpark.

Discussion:

The site at Bartraw consists of an isthmus, supporting a narrow strip of dune habitat, connecting to an island that supports abundant fixed dune habitat suitable for supporting Vertigo angustior. The snail was found across much of the island, as well as the northern part of the isthmus, but the dunes further south are too mobile to provide suitable habitat. Some pressures were identified for the site, but all are considered to be relatively small in scale. They include walking/trampling, horse-riding and storm-thrown shingle. Overall, Vertigo angustior is expected to continue to survive at the site. The site would benefit from the removal of horse-riding in the dunes, and a programme of dune restoration to repair damage caused along the isthmus by trampling and blow-outs.

Monitoring recommendations:

It is recommended that monitoring is carried out at a minimum of 3 yearly intervals, due to the fact that the site continues to be a stronghold for Vertigo angustior and because there has been appreciable recent storm damage. This should be re-assessed in light of any deterioration of condition or any changes to site management. Monitoring should follow that set out by Moorkens & Killeen (2011):

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable and wetness as Too wet, Optimal wetness or Too Dry
- Take 1 sample each from at least 5 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations (with a wide geographical spread, and including 1 on the northern end of the isthmus) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

Little management is required for the Vertigo angustior habitat on the island at Bartraw; however, horse-riding should not be allowed in the dunes. A restoration plan should be implemented (fencing, appropriate signage, etc.) to encourage the recovery of the dunes in polygons B and C where human tracks and blow-outs have resulted in abundant bare sand, leaving the dunes more exposed to future erosion and loss of habitat.

Vertigo angustior monitoring at Bartraw

2007-2012

Area of occupancy: Vertigo angustior habitat is present throughout most of the fixed dune system at the northern part of the isthmus and on the island, but is absent from the unfixed, southern part of the isthmus. Access is from the beach carpark.

Discussion:

The Condition of the site and the feature based upon the 2010 survey has been assessed as Favourable. This is one of the few areas of fixed dune in Clew bay and indeed in County Mayo. Not only is it important for its location but also for its size and relatively intact nature, and the large area of good Vertigo angustior habitat

It is important to ensure that no adverse changes are allowed to occur in the area, and that the requirements of the snail habitat are not compromised for other conservation priorities. Due to the importance of this site for Vertigo angustior, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the short to medium term. This site should also form part of a suite of important flora and fauna sites for long term surveillance studies, particularly in anticipation of potential effects of climate change.

Monitoring recommendations:

It is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2013
Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 5 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 6 other locations (with a wide geographical spread, and including 1 on the northern end of the isthmus) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

There was no evidence of any cattle or sheep grazing in 2010 and it did not appear that the site been grazed in the recent past.

Proposed management prescription for site

The site is currently in excellent condition for the snail, and no change of management is recommended between the periods 2010-2013. The high exposure of this windswept peninsula appears to be maintaining the ideal conditions for the snail.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Inishmore Island

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM16 **County:** Galway

SAC Site Code: 000213 Inishmore Island

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	12 July 2017	John Brophy & Maria Long
2007-2012	22-25 September 2006	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present at both sites is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The maritime grassland is species rich and also fits into this category. The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is Festuca rubra, with Plantago lanceolata, Trifolium pratense, Galium verum Pilosella officinarum, and Euphrasia, corresponding to SD8 of Rodwell (2000). The more undulating seaside dunes at Cill Mhuirbhigh have Festuca rubra, with Ammophila arenaria higher up, corresponding to SD7 of Rodwell (2000). The habitats fall within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra, and Ammophila arenaria, with sparse low growing herbs AND machair grassland with good botanical diversity. Vegetation height 10-40cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or above 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

The Vertigo angustior site of Inishmore Island comprises two well-separated areas: Cill Mhuirbhigh and the airport. The Cill Mhuirbhigh area includes fixed dune habitat close to the coast, while further inland it becomes machair grassland. The species was found frequently on the machair in the previous survey, but only a few of the most seaward sample locations were positive for the snail during the current survey. Vertigo angustior was only found in one sample from the large area of Polygon B, previously noted to be dominated by 'a dense, springy thatch of Festuca rubra', but now no longer supporting such a micro-habitat. No Vertigo angustior were recorded at the airport and much of the habitat there has either a dense moss layer in the understorey, or is too mobile. Overgrazing (at least from the point of view of the Vertigo angustior habitat) at Cill Mhuirbhigh appears to have resulted in the loss of much of Festuca rubra litter, leading to a drop in the suitability of the habitat and so management of grazing levels is required to allow the habitat to improve.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	L 82837 10285	Corner of two stone walls
End point:	L 82922 10297	Section of very dense Ammophila arenaria by sea wall
Transect length:	87	**Direction:** SW-NE
Description:	The transect runs across undulating Festuca rubra-dominated fixed dune grassland	
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Samples were taken at various intervals along the transect principally from zones with Optimal and Suboptimal habitat and analysed for their sanil composition	

TRANSECT: 2 **MONITORING PERIOD:** 2013-2018

Start point:	L 83125 09973	Wall by roadside
End point:	L 83133 10317	
Transect length:	276	**Direction:** N-S with bend
Description:	Linear sampling rather than transect, as in 2007-2012. Direction also reversed. Sloping machair grassland`.	
Sampling frequency:	Five samples taken in first 276m coinciding with previous sample locations	

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	L 82837 10284	From the southwest corner of the field by the walls	
End point:	L 82921 10300	By a double telegraph pole at the high dune edge above the seawall	
Transect length:	87.5	**Direction:**	SW-NE
Description:	The transect runs across undulating Festuca rubra dominated fixed dune grassland		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition		

TRANSECT: 2 **MONITORING PERIOD:** 2007-2012

Start point:	L 83125 09973	South-east corner of the field by the walls	
End point:	L 83133 10317	Wall by the roadside	
Transect length:	351	**Direction:**	S-N with bend
Description:	The transect runs across undulating Festuca rubra dominated fixed dune grassland		
Sampling frequency:	Eight samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat.		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	1.3186	Polygon A status remains Optimal-Suboptimal and is a combination of machair grassland and Festuca rubra and Ammophila arenaria dominated fixed dune habitat.
B	Suboptimal	16.5145	Polygon B status drops from Optimal and Suboptimal to Suboptimal. This polygon supports machair grassland, which has seen a loss of the Festuca rubra thatch noted in the previous survey, so this change is ecological. The boundary of this polygon was adjusted to coincide with an appropriate field boundary.
C	Optimal-Suboptimal	0.2079	Polygon C status was raised from Suboptimal to Optimal-Suboptimal due to the presence of sufficient suitable habitat. This change is due to interpretation.
D	Suboptimal-Unsuitable	1.4566	Polygon D status was raised from Unsuitable to Suboptimal-Unsuitable. This change is presumed ecological, with the habitat recovering from previous sand quarrying activities.
E	Suboptimal-Unsuitable	12.4116	Polygon E status was raised from Unsuitable to Suboptimal-Unsuitable, to reflect the fact that some of the habitat has the potential to support Vertigo angustior, though the area which is potentially suitable is small. This change in due to interpretation as there is no evidence of actual ecological change. The boundary was also revised to better reflect the situation on the ground.
F	Suboptimal	1.2957	Polygon F status remains Suboptimal. The boundary of the polygon was revised to better reflect the situation on the ground.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Sub-optimal with optimal areas	1.32	Polygon A - Cill Mhuirbhigh. Optimal and sub-optimal– fixed dune habitat
B	Sub-optimal with optimal areas	15.61	Polygon B - Cill Mhuirbhigh. Optimal and sub-optimal– mostly machair
C	Sub-optimal	0.22	Polygon C - Cill Mhuirbhigh. Sub-optimal – fixed and unfixed dune area and machair in old fields. Area C is a patch of fixed dune between the north road and the sea. It may be occasionally grazed, but very lightly, it is maintained by exposure.
D	Unsuitable	1.456	Polygon D - Cill Mhuirbhigh. Unsuitable – unfixed and damaged dunes. Area D consists of highly damaged dunes, parts of which were being excavated by JCB, as they were on a previous visit in 2003.

Vertigo angustior monitoring at Inishmore Island

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
E	Unsuitable	15.19	Polygon E - Airport. Unsuitable – habitat includes the runways, service areas and less fixed dunes around the margins. Area E is within the runway zone and is lightly mown on a very infrequent basis. However, the sward is tight and cropped and has developed a very compacted mossy habitat over the years.
F	Sub-optimal	2.207	Polygon F - Airport. Sub-optimal – fixed dune area with good Festuca habitat. Area F is unmanaged except for light trampling and occasional parking of cars, and storage of equipment. It retains a fixed dune habitat with a springy, thatched litter layer in areas outside those that are regularly subjected to damage.

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	29m	49m	9m			87m		
2								

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	87.5m	NA		NA		87.5m		
2		NA	Mostly optimal and sub-optimal	NA				

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 Transect 1 (3 samples)								
2013-2018	1	1	9m	0	0	0		Optimal
2013-2018	1	2	25m	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	1	3	78m	1	0	1	Presence/Absence	Optimal
Monitoring period 2007-2012 Transect 1 (3 samples)								
2007-2012	1	1	30m	0	0	1		
2007-2012	1	2	45m	0	0	1		
2007-2012	1	3	70m	0	0	0		
Monitoring period 2007-2012 Transect 2 (8 samples)								
2007-2012	2	1	L83125 09973 South-east corner of upper field. Rocky outcrops.	0	0	0		
2007-2012	2	2	L83138 10052 Some rocky outcrops. Machair	0	0	1		
2007-2012	2	3	L83141 10058	0	0	1		
2007-2012	2	4	L83156 10123 Near bottom north-east corner of upper field.	0	0	1		
2007-2012	2	5	Slopes in lower field. L83156 10203	0	0	1		
2007-2012	2	6	L83158 10229 Damper area with Carex spp.	0	0	1		
2007-2012	2	7	L83153 10260 Very similar to Sample site 5, orchid-rich.	0	0	1		

2007-2012	2	8	L83133 10317 Machair grassland near roadside wall	0	0	1	

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 (12 samples)							
2013-2018	01	L 83150 10376	0	0	0		Suboptimal
2013-2018	02	L 83133 10441	1	0	1	Presence/Absence	Optimal
2013-2018	03	L 83132 10326	1	0	1	Presence/Absence	Optimal
2013-2018	04	L 83154 10259	0	0	0		Optimal-Suboptimal
2013-2018	05	L 83157 10202	0	0	0		Optimal-Suboptimal
2013-2018	06	L 83154 10117	0	0	0		Optimal-Suboptimal
2013-2018	07	L 83140 10055	0	0	0		Optimal-Suboptimal
2013-2018	08	L 89161 07734	0	0	0		Optimal-Suboptimal
2013-2018	09	L 89414 07485	0	0	0		Suboptimal
2013-2018	10	L 89217 07159	0	0	0		Optimal-Suboptimal
2013-2018	11	L 89217 07196	0	0	0		Optimal-Suboptimal
2013-2018	12	L 89284 07218	0	0	0		Suboptimal
Monitoring period 2007-2012 (1 sample)							
2007-2012	Airp	L 89300 07300	0	0	1		

5. CONDITION ASSESSMENT

5.1 Population Assessment: 4 passes Favourable (green); 2-3 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 2 of the habitat zones on Transect 1 (from at least 3 samples)	Present in 2 out of 3 samples	Pass
2013-2018	2	Presence/Absence	Adult or sub-adults snails are present in 3 sample locations in Polygon B (from at least 5 samples)	Present in 1 sample location	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 2 of the habitat zones on transect 1 (from at least 3 samples)	Present in 2 zones (from 3 samples)	Pass
2007-2012	2	Presence/Absence	Adult or sub-adult snails are present in 3 sample locations on transect 2 (from at least 5 samples)	Present in 7 locations (from 8 sampled)	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present within the Optimal and suboptimal habitat at the airport (minimum 5 samples)	Not present	Fail
2013-2018	Presence/Absence	Adult or sub-adult snails present in polygons C or D (minimum of one sample in each area)	Present in Polygon C	Pass
2007-2012	Presence/Absence	Adult or sub-adult snails are present within the optimal and sub-optimal habitat at the airport (minimum 5 samples)	Present	Pass

Mon. period	Population Notes
2013-2018	In the 2007-2012 monitoring period, the population assessment was Favourable (green), with two out of three samples on Transect 1 and seven out of eight samples on "Transect 2" positive for Vertigo angustior (note that "Transect 2" of Moorkens & Killeen (2011) was in fact linear spot sampling, with no measures of habitat suitability or wetness along zones,

2013-2018	as would be carried out in a typical transect). The snail was also present at the airport in the previous survey, but no details of numbers or locations of samples are given in the report of Moorkens & Killeen (2011). In the current survey, two out of three samples on Transect 1 were again positive, while only one out of five samples in Polygon B was positive. In addition, five further samples were carried out (but not presented here) in Polygon B in the current survey by an accompanying malacologist, all of which were negative. Vertigo angustior was found in one sample in Polygon C at Cill Mhuirbhigh, but not in Polygon D. The species was not found at the airport (Polygons E and F). Based on the criteria of Moorkens & Killeen (2011), with the addition of a new criterion to take into account polygons C and D, the Population Assessment for Inishmore is Unfavourable Inadequate (amber).
2007-2012	the snail is widespread in its distribution and frequently present in moderate to good numbers

5.2 Habitat Assessment: 4 passes Favourable (green); 2-3 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	At least 75m of habitat along Transect 1 is classed as Optimal AND Soils, at the time of sampling, are damp (Optimal wetness) and covered with a layer of humid thatch for at least 75m of the transect	78m Optimal and 87m Optimal wetness	Pass
2007-2012	1	Habitat extent	At least 75m of habitat along Transect 1 is classed as Optimal and soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 75m of the Transect	87.5m is Optimal habitat and optimal wetness	Pass
2007-2012	2	Habitat extent	Optimal and sub-optimal habitat is present at 6 locations on Transect 2	Present at 7 locations	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Area of occupancy	At least 2ha of the habitat at the airport is classed as Optimal-Suboptimal or better	0ha Optimal-Suboptimal or better	Fail
2013-2018	Habitat extent	At least 1.5ha of the habitat in polygons A, C and D at Cill Mhuirbhigh is Suboptimal or better	1.7ha Optimal-Suboptimal	Pass
2013-2018	Habitat extent1	Polygon B contains large areas (>12ha) of habitat that is classified as Optimal-Suboptimal or better	16.5ha Suboptimal	Fail
2007-2012	Area of occupancy	At least 2ha of the habitat at the airport is classed as optimal and sub-optimal	2.2 ha	Pass
2007-2012	Habitat extent	At least 15ha of the habitat at Cill Mhuirbhigh optimal and sub-optimal	17.13 ha	Pass

Mon. period	Habitat Notes
2013-2018	In the 2007-2012 monitoring period, polygons A and B were Optimal and Suboptimal, polygons C and F were Suboptimal, while polygons D and E were Unsuitable. In the current monitoring, Polygon A remained Optimal-Suboptimal. The status of Polygon B dropped to Suboptimal, and it had its boundary altered to better suit the boundaries on the ground. Polygon C status was increased to Optimal-Suboptimal, polygons D and E were increased to Suboptimal-Unsuitable, while Polygon F remained unchanged at Suboptimal. However, while some increases were made, these mostly related to interpretation of habitat quality, rather than to an observed ecological improvement. In fact, a distinct decline in a habitat quality (from the point of Vertigo angustior at least) was noted in the largest polygon, Polygon B. At the time of the last survey (2006) there was a dense layer of thatch, but in 2017, little to no such habitat (essential for the target species) was found in this area. Based on the criteria of Moorkens & Killeen (2011), with some changes to remove mention of Transect 2 (was not surveyed as a transect by Moorkens & Killeen) and to take account of habitat conditions across all polygons, the Habitat Assessment for Inishmore is Unfavourable Inadequate (amber).
2007-2012	Much of the habitat at the site appears to be in good condition for V. angustior,

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment

2013-2018	A03.02	non intensive mowing	Inside	Medium	Negative	10%	Moderate mowing is fine, but tighter mowing near runway is too much
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	55%	Grazing important, but level currently too high.
2013-2018	D04.02	aerodrome, heliport	Inside	High	Negative	8%	Runway and associated hard surfaces
2013-2018	G05.01	Trampling, overuse,	Inside	Low	Negative	0.01%	Trampling around WC at Cill Mhuirbhigh
2013-2018	K02.01	species composition change (succession)	Inside	High	Negative	20%	Dense moss layer in what are presumably old dunes around the airport (not ideal for Vertigo angustior)
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Low	Negative	17.1ha	(Cill Mhuirbhigh)
2007-2012	D04.01	airport	Inside	Medium	Neutral	17.4	

Mon. period	Future Prospects Notes
2013-2018	In the monitoring period 2007-2012, cattle-grazing was identified as having a negative influence, while the airport was considered neutral. In the current monitoring, cattle-grazing continues to be having a negative influence in Polygon B in particular, while path trampling close to the toilet block at Cill Mhuirbhigh affected a small area in a negative way. At the airport, the presence of the airport itself was considered to be a negative impact with its associated mowing, while succession of the dune vegetation to the north of the airport has resulted in the area developing a deep bryophyte layer, of low suitability for supporting Vertigo angustior. Balancing the various activities and their influence, and in particular the lack of thatch caused by slightly higher than suitable grazing levels in the large Polygon B, the Future Prospects for Inishmore are considered to be Unfavourable Inadequate (amber).
2007-2012	As the impacts are low to moderate rather than severe (see Section 7), Future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Amber	Amber	Amber	Amber
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2013-2018	Based on the Unfavourable Inadequate (amber) result for the Population Assessment, Habitat Assessment and Future Prospects, the Overall Assessment for Inishmore is Unfavourable Inadequate (amber).
2007-2012	

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the fixed dune and maritime grassland habitat at Cill Mhuirbhigh in the southwest of the island and the fixed dune habitat within the airport complex to the northeast of the island.

Discussion:

The Vertigo angustior site of Inishmore Island comprises two well-separated areas: Cill Mhuirbhigh and the airport. The Cill Mhuirbhigh area includes fixed dune habitat close to the coast, while further inland it becomes machair grassland. The species was found frequently on the machair in the previous survey, but only a few of the most seaward sample locations were positive for the snail during the current survey. Vertigo angustior was only found in one sample from the large area of Polygon B, previously noted to be dominated by 'a dense, springy thatch of Festuca rubra', but now no longer supporting such a micro-habitat. No Vertigo angustior were recorded at the airport and much of the habitat there has either a dense moss layer in the understorey, or is too mobile. Overgrazing (at least from the point of view of the Vertigo angustior habitat) at Cill Mhuirbhigh appears to have resulted in the loss of much of Festuca rubra litter, leading to a drop in the suitability of the habitat and so management of grazing levels is required to allow the habitat to improve.

Monitoring recommendations:

Monitoring should be carried out on a 3-yearly basis, as set out by Moorkens & Killeen (2011) and with some modifications:

- Repeat Cill Mhuirbhigh Transect 1, delineate the plant community/habitat zones, and assign the habitat in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable
- Take 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take at least 5 samples in Polygon B and analyse for molluscan composition
- Describe habitat and take at least 1 sample in each of polygons C & D and analyse for molluscan composition
- Describe habitat and take at least 3 samples from the most suitable habitat at the airport and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

The machair grassland of Polygon B would benefit from a lower grazing level, in terms of duration or number of animals; however, care must be taken with any intervention to not allow the vegetation to become rank and thus unsuitable for supporting Vertigo angustior. The target would be to allow a build-up of Festuca rubra litter in a light, open thatch. It is thought that this change could be relatively easily implemented given good communication with the local landowner, and efforts to affect change should be taken immediately.

There are no management recommendations for the dunes in the vicinity of the airport, though the maintained grass areas could be made more suitable for supporting Vertigo angustior by reducing the mowing regime.

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the fixed dune and maritime grassland habitat at Cill Mhuirbhigh in the southwest of the island and the fixed dune habitat within the airport complex to the northeast of the Island.

Discussion:

The two sites are important habitat areas for V. angustior in Inishmore. While there are pockets of the species in maritime grassland in other parts of the island, the large population at Cill Mhuirbhigh in particular should be carefully conserved, along with the airport site which is an important population for the eastern part of the island.

Along with protecting the current habitat from fertilizer and excessive grazing, it would be useful to ensure that similar protection occurs in the naturally flooding dune areas along the coastal strip, which are currently not suitable for V. angustior but may be in the future if climate change promotes more favourable conditions for the snail there.

As the area of V. angustior habitat is very fixed at both sites relative to other sites for this species, it is important to regularly monitor the habitat areas, particularly those that are not grazed. Any succession to scrub would be detrimental to V. angustior which requires open, unshaded habitat, but this does not appear to be an immediate threat.

Monitoring recommendations:

Given the site is in excellent Condition, both in terms of habitat and Vertigo angustior distribution and abundance, it is recommended that monitoring is carried out at 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2011
Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat Cill Mhuirbhigh transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Repeat Cill Mhuirbhigh transect 2, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 5 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in at least 5 locations at the airport site and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

The Cill Mhuirbhigh Area A consists of a strip of land between the road and the seawall, east of the toilet block. This is lightly grazed by cattle. Area B consists of a block of fields rising from the road up to a rocky crest. The ground is always sloping and a dense, springy thatch of Festuca rubra dominates the vegetation. This area is lightly grazed by cattle. Area C is a patch of fixed dune between the north road and the sea. It may be occasionally grazed, but very lightly, it is maintained by exposure. Area D consists of highly damaged dunes, parts of which were being excavated by JCB, as they were on a previous visit in 2003.

At the Airport site, two management units can be distinguished. Area E is within the runway zone and is lightly mown on a very infrequent basis. However, the sward is tight and cropped and has developed a very compacted mossy habitat over the years. Area F is unmanaged except for light trampling and occasional parking of cars, and storage of equipment. It retains a fixed dune habitat with a springy, thatched litter layer in areas outside those that are regularly subjected to damage.

Proposed management prescription for site

The management at Cill Mhuirbhigh should remain the same as the present regimes within each management unit for the 2011 - 2014 period. The machair areas (polygon B) should remain grazed by cattle with no more than 0.8 livestock units per hectare, and grazing periods should typically be in the spring to autumn periods, with animals removed for the winter. Livestock should be young suckler or mixed age cattle. There should be no lowering or intensifying of this regime. There should be no supplementary feeding of animals within the Vertigo angustior habitat, with animals removed at the first signs of hunger. There should be no improvement with fertiliser or drainage of any of the habitat area. There should be no change to sheep grazing at any time of the year.

The management at the airport site is not required to be changed specifically – there are patches of suitable habitat within the runway area (at the edges which are not mowed or trampled as much as the main pathways), but care should be taken not to put any herbicides or paths at the edges where the habitat is best. The same precautions also need to be taken where parking and storage or placing of portacabins and other structures need to be reviewed in the light of the presence of this important habitat. No formal

grazing or mowing management is recommended, this area is suitable for continued maintenance by exposure and light trampling, but must be kept clear of cars.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Curragh Chase

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM17 **County:** Limerick

SAC Site Code: 000174 Curraghchase Woods

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	3-4 October 2016	John Brophy & Maria Long
2007-2012	5 May 2010	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The site supports different areas with grassland marsh transition, or grassland marsh fen transition, but in each case permanently waterlogged but not inundated ground on mineral soil, mostly the ecotone between Potentilla anserina dominated wet grassland and the Iris marsh lying upslope from the Schoenus fen. The general habitat in which Vertigo angustior is present here is marsh, i.e. permanently waterlogged ground on mineral soil, and the ecotone between Festuca rubra and Potentilla anserina wet grassland and the waterlogged marsh. These are not Annex I nor CORINE listed habitats, but they are important in that they support the so called "marsh phase" or inland habitat of Vertigo angustior. The locations of suitable ecotone include Festuca rubra, Potentilla anserina, Iris pseudacorus, Juncus acutiflorus, Carex disticha, Eleocharis palustris, Holcus lanatus, and Lathyrus pratensis communities. This includes ecotones that include the Rodwell categories of M28, MG10 and MG11 (Rodwell, 1991, 1992). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of this unshaded habitat. The habitat falls within the more general habitat of freshwater marsh (GM1) and wet grassland (GS4) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Saturated transition marsh with Juncus, Mentha aquatica, occasional Schoenus tussock (height 25-40cm) with an under-storey of moss and litter, going into grassland with Festuca rubra, Potentilla anserina, Ranunculus repens with a good thatch and/or moss layer.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between or > 50cm, or the ground has pools of standing water, or the thatch is wetter with a denser structure or has little moss.
Unsuitable	Not defined

2. SUMMARY:

The previous monitoring survey, in 2010, found that the site had deteriorated since the species was discovered there in 2005. This decline in quality was attributed to trampling and grazing by cattle. The current survey has shown that the site continues to decline in terms of habitat quality, and particularly in terms of population, with no Vertigo angustior found in the course of sampling in 2016. The failure to find the species does not mean that the population is extinct, but it does raise serious concerns, and repeat surveying is needed immediately.

A slightly higher than desirable level of grazing and trampling by cattle continues to have a negative effect on the site, and scrub clearance and dumping has also occurred (within the SAC boundary). The effects of the grazing is particularly notable along the transect, as a shift from fen to grassland can clearly be seen to have occurred since the last monitoring period. While grazing pressure, dunging, and associated agricultural effects are undoubtedly important in driving this change, it may be facilitated and/or accelerated by changes in hydrological regime (however studies are needed to confirm this).

As noted by Moorkens & Killeen (2011), the site is important as it is the only known Vertigo angustior site in County Limerick, and is one of only a handful of inland sites in Ireland. Furthermore, there are no known sites at all in the neighbouring counties of Cork, Tipperary, Waterford, nor further towards the south-east of Ireland. It is also vulnerable as it is partly outside the boundary of the Curraghchase Woods SAC (the western portion of the polygon, including the transect, is outside the SAC). Immediate contact needs to be made between local NPWS staff and the landowner/land manager about stock management and scrub removal and dumping, as small changes would be very beneficial. Extending the SAC boundary slightly should also be considered to afford this important site some added protection.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	R 41066 48469	Second fence post in from end.	
End point:	R 41010 48474		
Transect length:	55	**Direction:**	As for 2010
Description:	As for 2010		
Sampling frequency:	As for 2010		

Vertigo angustior monitoring at Curragh Chase

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	R 41069 48479	Second fence post in by ditch	
End point:	R 41012 48474	Grassland under electric fenceline	
Transect length:	50	**Direction:**	E-W
Description:	The transect starts at a ditch and runs upslope through flushes with Schoenus and mosses, into wet fen and then into Festuca grassland		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Five samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal	3.1883	Polygon A status was dropped from Optimal and Suboptimal to Suboptimal due to ecological change - localised effects of grazing by cattle has led to the loss of fen habitat. No boundary change.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
	Sub-optimal with optimal areas	3.19	All of the potential V. angustior habitat lies within a single polygon, a field unit which comprises a mosaic of marsh, fen and grassland, and is classed overall as Optimal and sub-optimal.

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1			13m	18m	24m	18m	13m	24m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		NA	50m	NA		35m	15m	

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 Transect 1 (3 samples)							
2013-2018	1	1	6m	0	0	0	Suboptimal
2013-2018	1	2	16m	0	0	0	Suboptimal
2013-2018	1	3	25m	0	0	0	Suboptimal-Unsuitable
Monitoring period 2007-2012 Transect 1 (5 samples)							
2007-2012	1	1	7m	0	0	2	
2007-2012	1	2	12m	0	0	5	
2007-2012	1	3	21m	0	0	2	
2007-2012	1	4	29.5m	0	0	0	
2007-2012	1	5	40.5m	0	0	0	

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 (4 samples)						
2013-2018	01	R 41029 48544	0	0	0	Suboptimal
2013-2018	02	R 41088 48517	0	0	0	Suboptimal-Unsuitable
2013-2018	03	R 41155 48548	0	0	0	Suboptimal

2013-2018	04	R 41173 48519	0	0	0	Suboptimal
Monitoring period 2007-2012 (11 samples)						
2007-2012	01	R 41191 48556	0	0	0	
2007-2012	02	R 41171 48551	0	0	0	
2007-2012	03	R 41175 48521	0	0	1	
2007-2012	04	R 41151 48544	0	0	1	
2007-2012	05	R 41093 48499	0	0	0	
2007-2012	06	R 41063 48490	0	0	0	
2007-2012	07	R 41052 48529	0	0	6	
2007-2012	08	R 41048 48467	0	0	12	
2007-2012	09	R 41043 48451	0	0	7	
2007-2012	10	R 41041 48546	0	0	1	
2007-2012	11	R 41073 48558	0	0	0	

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 2 zones with optimal or sub-optimal habitat on the transect (minimum 3 samples)	Adult or sub-adult snails absent from Transect 1 (3 samples)	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 2 zones with optimal or sub-optimal habitat on the transect (minimum 3 samples)	present in 2 zones	Pass

Mon. period	Population Notes
2013-2018	In the monitoring period 2007-2012, Vertigo angustior was recorded at three out of five locations on Transect 1 and six out of eleven spot samples at other locations within the polygon. In the current monitoring period, all three samples on the transect and four spot samples from other locations were found to be negative for the species. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment for Curragh Chase is Unfavourable Bad (red).
2007-2012	the snail is scattered in its distribution and present in rather low numbers

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	At least one zone of the habitat along the Transect is classed as Optimal , and 40m of habitat along the Transect is classed as Sub-Optimal or Optimal	No zones are Optimal AND 13m is Suboptimal	Fail
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch/moss for 40m of the Transect	18m is Optimal wetness	Fail
2007-2012	1	Habitat extent	At least one zone of the habitat along the Transect is classed as Optimal and 40m of habitat along the Transect is classed as Sub-Optimal or Optimal	No zones are Optimal AND 55.5m is Sub-Optimal	Fail
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch/moss for 40m of the Transect	40.5m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail

2013-2018	Habitat extent	At least 3ha of the site sub-optimal with optimal areas	3.19ha Suboptimal	Fail
2007-2012	Habitat extent	At least 3ha of the site sub-optimal with optimal areas	3.19 ha	Pass

Mon. period	Habitat Notes
2013-2018	In the monitoring period 2007-2012, the habitat polygon (3.19ha) was classed as Optimal and Suboptimal, with the transect consisting entirely of Suboptimal habitat. In the current survey, the polygon was dropped to Suboptimal, and most of the habitat along the transect had also dropped in suitability. It is particularly clearly evident along the transect that parts of the site are transitioning from fen to grassland – this may be due to water regime changes in part, but grazing pressure is also playing a significant role. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Curragh Chase is Unfavourable Bad (red).
2007-2012	Much of the habitat at the site is not in optimal condition for V. angustior,

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	15%	Herd of 18 cattle with access to fen, but predominatly graze grassland above. 15% relates to Transect area (Cattle grazing considered positive by preventing scrubbing over)
2013-2018	A10.01	removal of hedges and copses or scrub	Inside	Low	Negative	15%	Scrub removal, with associated dumping in fen
2013-2018	H05.01	garbage and solid waste	Inside	High	Negative	5%	Dumping of spoil and cleared scrub. Habitat lost.
2007-2012	A04.02.01	non intensive cattle grazing	Inside	Medium	Negative	3.19ha	Although the grazing is non-intensive, the numbers of cattle are too high for such a small site, and therefore the influence is negative and the intensity moderate.

Mon. period	Future Prospects Notes
2013-2018	The Future Prospects for Vertigo angustior at Curragh Chase were classed as Unfavourable Inadequate (amber) in the monitoring period 2007-2012, with non-intensive cattle grazing the only activity recorded. In the current monitoring period, non-intensive cattle grazing continues to be a negative impact, but scrub removal and dumping of brash is also impacting the site. Based on this, along with the decline in the population and habitat assessments, the Future Prospects for Curragh Chase are considered to be Unfavourable Bad (red).
2007-2012	As the impact is moderate rather than severe, Future prospects have been assessed as Unfavourable inadequate

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Red	Red	Red	Red
2007-2012	Green	Amber	Amber	Amber

Mon. period	Overall Notes
2013-2018	As the Population Assessment, Habitat Assessment and Future Prospects all returned Unfavourable Bad (red) results, the Overall Assessment for Curragh Chase is Unfavourable Bad (red).
2007-2012	

6. DISCUSSION

Monitoring period
2013-2018

Vertigo angustior monitoring at Curragh Chase

Area of occupancy: Vertigo angustior occurs in a marsh to the north-east of Curragh Chase Forest Park. Access is from a minor road across privately owned land at R409483.

Discussion:

The previous monitoring survey, in 2010, found that the site had deteriorated since the species was discovered there in 2005. This decline in quality was attributed to trampling and grazing by cattle. The current survey has shown that the site continues to decline in terms of habitat quality, and particularly in terms of population, with no Vertigo angustior found in the course of sampling in 2016. The failure to find the species does not mean that the population is extinct, but it does raise serious concerns, and repeat surveying is needed immediately.

A slightly higher-than-desirable level of grazing and trampling by cattle continues to have a negative effect on the site, and scrub clearance and dumping has also occurred (within the SAC boundary). The effects of the grazing is particularly notable along the transect, as a shift from fen to grassland can clearly be seen to have occurred since the last monitoring period. While grazing pressure, dunging, and associated agricultural effects are undoubtedly important in driving this change, it may be facilitated and/or accelerated by changes in hydrological regime (however studies are needed to confirm this).

As noted by Moorkens & Killeen (2011), the site is important as it is the only known Vertigo angustior site in County Limerick, and is one of only a handful of inland sites in Ireland. Furthermore, there are no known sites at all in the neighbouring counties of Cork, Tipperary, Waterford, nor further towards the south-east of Ireland. It is also vulnerable as it is partly outside the boundary of the Curraghchase Woods SAC (the western portion of the polygon, including the transect, is outside the SAC). Immediate contact needs to be made between local NPWS staff and the landowner/land manager about stock management and scrub removal and dumping, as small changes would be very beneficial. Extending the SAC boundary slightly should also be considered to afford this important site some added protection.

Monitoring recommendations:

Given that the site appears to be continuing to deteriorate, both in terms of habitat suitability and Vertigo angustior distribution and abundance, it is recommended that a repeat survey is carried out immediately (i.e. 2017 or 2018) and based on the findings, that monitoring needs are reviewed. It is likely that monitoring carried out at a minimum of three-yearly intervals will be needed. Monitoring should follow that proposed by Moorkens & Killeen (2011):

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too dry, Optimal wetness or Too dry, respectively
- Take 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 4 other locations and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

While cattle grazing is required at this site to prevent scrubbing over, it is clear from the transect results that the western edge of the fen is being lost to grassland due to grazing, trampling and nutrient level changes due to dunging. Cattle also have access to the wetter areas of marsh to the southeast of the habitat polygon. The level of grazing should be reduced in terms of duration and/or number of cattle, in order to allow the habitat to recover. Grazing in spring and autumn may be most suitable, thus avoiding both the wettest and the driest times of year. Temporarily fencing off of the most vulnerable parts of the fen may be a workable solution if cattle need to be grazed on other adjacent parts for longer periods. Careful monitoring will be required to assess the appropriateness of any changes to the management regime in this small and vulnerable site.

Vertigo angustior monitoring at Curragh Chase

2007-2012

Area of occupancy: Vertigo angustior occurs in a marsh to the north-east of Curragh Chase Forest Park. Access is from a minor road across privately owned land at R409483.

Discussion:

The Condition of the site and the feature based upon the 2008 survey has been assessed as Unfavourable Inadequate due to the condition of the habitat on the transect.

Based upon changes observed since the corrected discovery in 2003 and since the last survey in 2003, and the pilot survey in 2008, it appears that there is a decline in habitat quality, along with a contraction in the distribution and abundance of Vertigo angustior. It is likely that the decline results to some extent from trampling and poaching by cattle in the best area of marsh and transition grassland.

This is the only site in County Limerick known to support Vertigo angustior, and thus it is of high importance although it is just outside the boundary of the cSAC and it is not listed as a qualifying interest for the cSAC. Given the importance of the site, particularly in terms

Monitoring recommendations:

Given the evidence for a possible deterioration in the Condition of the site, both in terms of habitat and Vertigo angustior distribution and abundance, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2013
Methods (see Section 3 of main report for full details) Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 3 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 4 other locations and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

Over 20 head of cattle had access to the V. angustior habitat at the time of the survey (early May 2010). It is not known whether cattle are excluded from the fen at certain times of the year, or if this number of cattle varies on a seasonal basis.

Proposed management prescription for site

A management programme needs to be introduced if the snail is to thrive at this site. The number of cattle or the length of grazing period needs to be reduced to a level that is not damaging to the habitat. The ideal grazing regime would be suckler or mixed age cattle, approximately 10 livestock units, and grazing periods should typically be in the spring to autumn periods, with animals removed for the winter. There should be no introduction of supplementary feeding of animals within the Vertigo angustior habitat, with animals removed at the first signs of hunger. If it is not possible to exclude animals in winter and spring, in order to protect the habitat, the V. angustior habitat should be fenced off using temporary electric fencing to allow the habitat to recover.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Louisa Bridge

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM19 **County:** Kildare

SAC Site Code: 001398 Rye Water Valley/Carton

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	24-Jun-16	John Brophy & Maria Long
2007-2012	16 April 2010	Evelyn Moorkens & Ian Killeen

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present is the rich forb flood plain transition zone habitat on the banks of the river, with active springs on well drained mineral soil above. This is an ecotone between marsh and humid meadow, flushing with saturated water rather than inundated by flooding. There are no EU habitats that correspond to this habitat, the closest CORINE category would be Atlantic and sub-Atlantic humid meadows (37.21) (Devillers et al., 1991). Iris preudacorus, Glyceria maxima and Petasites fragrans form the dominant vegetation with sub storey mosses in places. The habitat falls within the more general classification of freshwater marsh (GM1) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Wet grassland dominated by Iris pseudacorus, low herbs and mosses up to 0.9m high. Habitat growing on damp, friable soil covered with a layer of humid, open structured moss and litter.
Sub-optimal	The Iris grassland is >0.9m high, or the water table is below 5cm or ground is flooded at the time of sampling.
Unsuitable	Not defined

2. SUMMARY:

The area which supported Vertigo angustior at this site in the past was always relatively small and marginal (i.e. at the interface between the swamp vegetation of the river floodplain and the tufaceous slopes above). Here the snail would have been found in unshaded vegetation consisting mostly of Iris pseudacorus, with a mossy understorey. This vegetation type is now largely lost, being limited to a shaded strip adjacent to willow trees. This may be due mostly to natural changes taking place in the absence of management – i.e. a build-up of tall dense vegetation, and a development of a line of willows leading to shading, but alterations along the Rye River catchment may also have had an influence on the hydrological regime at the site. Even with management, it would likely have been difficult to have retained suitable habitat at this site for Vertigo angustior. Experimental cutting of vegetation at the site was carried out by Kildare County Council in the past, but does not appears to have had long-term benefits (Moorkens & Killeen, 2011).

Given that the species has not been found here since the late 1990s, in spite of repeated surveys, the continued occurrence of Vertigo angustior at this site is far from certain. Given the importance of this site (the most eastern site in Ireland, also one of only a handful of inland sites, and the fact that Vertigo moulinsiana is also found here), and the fact that the species is difficult to detect, particularly in small populations, short surveys should be continued for at least another two rounds.

3. TRANSECT DETAILS

TRANSECT: 0 **MONITORING PERIOD:** 2007-2012

Start point: NO TRANSECT RECORDED

End point:

Transect length: **Direction:**

Description:

Sampling frequency:

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Suboptimal-Unsuitable	0.5296	Polygon A status remains Suboptimal-Unsuitable.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
	Sub-optimal with unsuitable areas	0.61	All of the potentially suitable V. angustior habitat at Louisa Bridge lies within one polygon area of approximately 0.606 ha

Vertigo angustior monitoring at Louisa Bridge

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
0								

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2007-2012 Transect 0 (1 sample)							
2007-2012	0	0	NO TRANSECT RECORDED				

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 (3 samples)						
2013-2018	01	N 99435 36872	0	0	0	Suboptimal-Unsuitable
2013-2018	02	N 99465 36855	0	0	0	Suboptimal
2013-2018	03	N 99515 36846	0	0	0	Suboptimal-Unsuitable
Monitoring period 2007-2012 (5 samples)						
2007-2012	01	N 99431 36876	0	0	0	
2007-2012	02	N 99448 36860	0	0	0	
2007-2012	03	N 99463 36849	0	0	0	
2007-2012	04	N 99511 36827	0	0	0	
2007-2012	05	N 99544 36838	0	0	0	

5. CONDITION ASSESSMENT

5.1 Population Assessment: 1 pass Favourable (green); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2007-2012	0	N/A	NO TRANSECT RECORDED		

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	Vertigo angustior is present at the site	Not found	Fail
2007-2012	Presence/Absence	Vertigo angustior is present at the site	Not found	Fail

Mon. period	Population Notes
2013-2018	Vertigo angustior was last recorded at Louisa Bridge in 1997, despite several surveys in the intervening period. In the monitoring period 2007-2012, all five locations sampled returned negative results. In the current monitoring period, the species was again not found at the site, with four locations sampled. While not impossible that the species survives at the site, it becomes increasingly unlikely given multiple negative surveys over a 20 year period. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment for Louisa Bridge is Unfavourable Bad (red).
2007-2012	Snail could not be found

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2007-2012	0	N/A	NO TRANSECT RECORDED		

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	At least 0.2ha of the site should support habitat which is classed as optimal and sub-optimal	0.53ha Suboptimal-Unsuitable	Fail

2007-2012	Habitat extent	At least 0.2ha of the site should support habitat which is classed as optimal and sub-optimal	0.61 ha classed as sub-optimal and unsuitable	Fail

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	The habitat at all sample sites is classed as Optimal or Suboptimal (minimum 3 samples)	Habitat at 1 sample site Suboptimal	Fail
2013-2018	Habitat quality	Soils, at time of sampling, at all sample sites are damp (optimal wetness)	Soils of Optimal wetness at 3 sample sites	Pass
2007-2012	Habitat extent	The habitat at all 5 sample sites is classed as Optimal or sub-optimal	All 5 sites are sub-optimal	Pass
2007-2012	Habitat quality	Soils, at time of sampling, at all 5 sample sites are damp (optimal wetness)	All 5 sites are optimal wetness	Pass

Mon. period	Habitat Notes
2013-2018	The habitat polygon was classed as Suboptimal and Unsuitable in the previous monitoring period and remains Suboptimal-Unsuitable in the current monitoring. Overall, only a small area running roughly parallel to the river, near the line of willow trees, has potential to support Vertigo angustior, and even here the vegetation is mostly too tall and dense. The litter is also too dense in places, and there is too much shade. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Louisa Bridge is Unfavourable Bad (red).
2007-2012	Very little of the habitat at the site is in good condition for V. angustior

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	K02.01	species composition change	Inside	Medium	Negative	100%	Spread of willow and other tree species
2007-2012	A04.03	abandonment of pastoral systems, lack of grazing	Inside	Medium	Negative	0.6ha	The impacts are likely to have been long term and although minor in the short term, they have been in a negative direction for a long time.
2007-2012	J02.04.01	flooding	Inside	Medium	Negative	0.6ha	
2007-2012	J02.05.02	modifying structures of inland water courses	Outside	Medium	Negative	0.6ha	

Mon. period	Future Prospects Notes
2013-2018	There is currently no active management within the Vertigo angustior polygon at this site. As the vegetation continues to develop via succession, shading and dense litter will continue to become more of a problem, and the suitability of the site for supporting Vertigo angustior is likely to continue to decrease. There are few obvious other discernible impacts on the site (e.g. unclear whether the hydrological regime has changed). Thus the Future Prospects for the site are considered to be Unfavourable Bad (red).
2007-2012	As the impacts are likely to have been long term and although minor in the short term, they have been in a negative direction for a long time and thus, Future prospects have been assessed as Unfavourable bad

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Red	Red	Red	Red
2007-2012	Red	Amber	Red	Red

Mon. period	Overall Notes
2013-2018	The Habitat Assessment, Population Assessment and Future Prospects were all Unfavourable Bad (red), resulting in an Overall Assessment for Louisa Bridge of Unfavourable Bad (red).

2007-2012

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the flood plain habitat at the base of the spring fed slope along the banks of the Rye Water River. Access is from the main road down a series of paths, steps and boardwalks

Discussion:

The area which supported Vertigo angustior at this site in the past was always relatively small and marginal (i.e. at the interface between the swamp vegetation of the river floodplain and the tufaceous slopes above). Here the snail would have been found in unshaded vegetation consisting mostly of Iris pseudacorus, with a mossy understorey. This vegetation type is now largely lost, being limited to a shaded strip adjacent to willow trees. This may be due mostly to natural changes taking place in the absence of management - i.e. a build-up of tall dense vegetation, and a development of a line of willows leading to shading, but alterations along the Rye River catchment may also have had an influence on the hydrological regime at the site. Even with management, it would likely have been difficult to have retained suitable habitat at this site for Vertigo angustior. Experimental cutting of vegetation at the site was carried out by Kildare County Council in the past, but does not appear to have had long-term benefits (Moorkens & Killeen, 2011).

Given that the species has not been found here since the late 1990s, in spite of repeated surveys, the continued occurrence of Vertigo angustior at this site is far from certain. Given the importance of this site (the most eastern site in Ireland, also one of only a handful of inland sites, and the fact that Vertigo moulinsiana is also found here), and the fact that the species is difficult to detect, particularly in small populations, short surveys should be continued for at least another two rounds.

Monitoring recommendations:

In light of the apparent disappearance of Vertigo angustior from the site, Moorkens & Killeen (2011) recommend that a brief presence/absence survey should be carried out at 2-yearly intervals. If the species if re-found then this should be re-assessed and monitoring effort and detail increased. Thus, for now, the monitoring should consist of the following:

- Describe habitat and take at least 1 sample from the most suitable habitat in each of at least 3 locations and analyse for molluscan composition

Management recommendations:

Given that apart from succession there are few obvious discernible impacts on the site, it is difficult to propose management changes that might improve the situation. Manual cutting of vegetation to try to encourage a more open structure was carried out in the past, but vegetation had re-grown to its original extent within six months. This means that it may be considered too labour intensive to maintain. Also, the required frequency of works could lead to trampling and other damage. Overall, therefore, management intervention is currently not recommended. However, if the species is re-found, a regime of cutting (manually, not with machines) an approximate 5m strip along the edge of the willows (following the line where the samples are taken) twice per year should be instigated immediately and maintained. This would aim to reduce the overall height of vegetation, density of vegetation and density of litter. Cuttings should be removed from the site, and great care must be taken to avoid inadvertent damage by trampling.

The area upslope at Louise Bridge should continue to be managed as it is - i.e. no increase in recreational use, no ornamental planting, no use of fertiliser/herbicide/etc. and no attempt to alter the hydrology of the springs.

Vertigo angustior monitoring at Louisa Bridge

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the flood plain habitat at the base of the spring fed slope along the banks of the Rye Water River. Access is from the main road down a series of paths, steps and boardwalks

Discussion:

The river margin flood plain and sloping flushing spring seepages above it are very rare habitats in Ireland and unusual also in lying so close to an intensively built up location within the greater Dublin area. Along with the V. moulinsiana habitat and the tufa spring and fen habitats above, this area requires strict protection from dumping, spraying, drainage of the complex hydrogeological area that drive the springs, and also from well meaning schemes that could inadvertently change the habitat such as tree planting or amenity pathways.

Due to the importance and location of this site for Vertigo angustior and V. moulinsiana, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the short to medium term. This site should also form part of a suite of important flora and fauna sites for long term surveillance studies in anticipation of potential effects of climate change and intensification of regional land use.

The most likely reasons for the decline of V. angustior at the flood plain habitat are changes that have taken place in the long term. It is likely that the snail was present at this site for hundreds and possibly thousands of years. Up to 100 years ago it was likely to have been part of a low intensity grazing regime. However, with the development of the spa and the transfer to public land, grazing at some stage was removed and natural succession has occurred in the upper part of the V. angustior habitat. In addition, there have been modifications in the more recent past to the Rye Water River, evident from spoil heaps close to the river bank. The changed profile of the river channel appears to have resulted in part of the habitat being drier than in previous times, and other parts becoming regularly flooded in high flow periods. This is evident by visiting the site in winter and seeing the line of vegetation that has been pushed over where the water overflows at the slight bend. All of these changes in management have resulted in a loss of quality to both the upper and lower parts of the habitat, which is unsustainable for a long term population of this sensitive snail.

Monitoring recommendations:

Given the evidence for an overall deterioration in the Condition of the habitat at the site, and the apparent disappearance of Vertigo angustior, it is recommended that a brief presence/absence survey is carried out at 2 yearly intervals. This should be re-assessed if the snail is refound:

Frequency: Next monitoring due 2012
Methods (see Section 3 of main report for full details). Prescription as follows:
- Describe habitat and take at least 1 sample from the most suitable habitat in each of at least 3 locations and analyse for molluscan composition

Management recommendations:

Existing Management

The potential V. angustior habitat at this site comprises a single management unit. There is currently no grazing or other active management within the area of the V. angustior habitat.

Proposed management prescription for site

An experimental cutting of the upper habitat vegetation was carried out by Kildare County Council as part of the attempt to understand the reason for the loss of the snail at this site. Within 6 months, the vegetation had grown to previous levels, and was not maintained for an extended period by wetness as would be expected in a functioning V. angustior habitat. A hydrogeological study at the site did not relate any changes in the wider catchment hydrogeology to changes in the flood plain, so there does not appear to be much that can be done to improve the habitat at this flood plain area. As a consequence, there is no recommendation for active management at the flood plain at present. As habitat changes in the upper terraces, potential V. angustior habitat may expand away from the flood plain and any small numbers of V. angustior remaining in refugia could spread, or be re-introduced. As the levels of calcium at the site are ideal for V. angustior, it would be unfortunate to lose it from this historical site.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Ballysadare Bay

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM20 **County:** Sligo

SAC Site Code: 000622 Ballysadare Bay

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	27 June 2016	John Brophy & Maria Long
2007-2012	20 May 2010	Ian Killeen & Maria Long

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). There is also some potential habitat within the ecotone between the fixed dunes and the dune slack (Annex I 2190, CORINE 16.3) to the south west of the large bare dune (Shelly Valley) valley. However, the main area of distribution of the snail is on the barely fixed dunes of the majority of the peninsula to the south west of this. The dominant vegetation is Festuca rubra with Ammophila arenaria, corresponding to SD7 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra, and Ammophila arenaria, with sparse Leucanthemum vulgare, Taraxacum, Plantago lanceolata and other low growing herbs. Vegetation height 20-50cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or above 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

The site at Ballysadare Bay supports extensive Vertigo angustior habitat and a good population of the snail, with adult snails found at all but one of the twelve sample locations (and a juvenile Vertigo angustior was found at this sample location within the golf course). The habitat comprises extensive fixed dune, with a good Festuca rubra thatch in places under Ammophila arenaria. While the habitat is good for the snail, there is some indication that it may be becoming rank, particularly in Polygon A. Some areas have been affected by trampling and blowouts (Polygons B and C), while the maintenance of the golf course has limited suitable habitat to areas of rough within its footprint (Polygon E). Management actions are necessary to address some of the issues at the site including potentially introducing light cattle grazing to Polygon A, a more sensitive mowing regime for roughs on the golf course, and measures to address the negative effects of trampling and to allow the revegetation of blowout areas.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	G 59677 35072	Stone at top of dune crest.	
End point:	G 59679 35006		
Transect length:	60	**Direction:**	As for 2010
Description:	As for 2010		
Sampling frequency:	As for 2010		

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	G 59677 35071	Top of dune crest	
End point:	G 59680 35014	Grassland	
Transect length:	60	**Direction:**	N-S
Description:	The transect runs across undulating Festuca rubra dominated fixed dune grassland, from a high dune crest.		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Four samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition		

4. RESULTS

Vertigo angustior monitoring at Ballysadare Bay

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	38.8842	Polygon A status drops from Optimal to Optimal-Suboptimal - Based on notes from Moorkens & Killeen (2011) relating to the transect and other areas (where they mention bare ground and bryophyte cover, for example), it would appear that the polygon has become a little more rank overall, and so this change is ecological. This is a large expanse of fixed dune habitat, with Ammophila arenaria, Festuca rubra and Arrhenatherum elatius the main species throughout. Cover of A. elatius is probably higher than would be ideal.
B	Suboptimal	15.4198	Polygon B was merged with Polygon D, but its status remains Suboptimal. There is more diversity of habitat type here compared to Polygon A, with areas of low-growing vegetation, mossy areas, some areas of bare ground and dune slack. Areas with Ammophila arenaria and associated Festuca rubra thatch are more limited to higher parts of dunes. Botanical diversity is much greater in this area than in Polygon A. Some parts of the eastern boundary of this polygon were re-mapped - see notes on Polygons C and E for explanation.
C	Unsuitable	15.8093	Polygon C status remains Unsuitable - Large area of blow-out, consisting of either bare sand, or very mobile dune. Judging by aerial photographs, this area may be re-vegetating, and so its status should be re-assessed at the next monitoring survey. Two areas from within Polygon C were reassigned to be part of Polygon B due to having habitat and vegetation which is similar, and being contiguous.
E	Suboptimal-Unsuitable	38.4549	Polygon E status remains Suboptimal-Unsuitable and consists largely of the golf course. The polygon boundary was re-mapped in two places to better delineate the area which is managed as golf course. The course contains areas of rough, which are under a variety of management regimes. In some of these areas, habitat suitable for Vertigo angustior exists.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	38.994	Polygon A - fixed dune habitat
B	Sub-optimal	15.419	Polygon B - fixed and unfixed dune area
C	Unsuitable	15.821	Polygon C - area known as shelly valley, mostly bare, high dunes
D	Unsuitable	2.051	Polygon D - small dune slack
E	Sub-optimal with unsuitable areas	38.455	Polygon E - Most of this area is within Strandhill Golf course where there are areas of rough where the habitat is sub-optimal for V. angustior

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1		60m				60m		

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	60m	NA		NA		60m		

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 Transect 1 (4 samples)								
2013-2018	1	1	6.5m	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	1	2	15m	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	1	3	25m	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	1	4	47m	1	0	1	Presence/Absence	Optimal-Suboptimal
Monitoring period 2007-2012 Transect 1 (4 samples)								
2007-2012	1	1	2m	120	25	145		
2007-2012	1	2	13m	20	2	22		
2007-2012	1	3	26m	18	10	28		

2007-2012	1	4	40m		35	5	40

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 (8 samples)							
2013-2018	01	G 59559 34801	1	0	1	Presence/Absence	Optimal
2013-2018	02	G 59545 34421	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	03	G 59539 34220	1	0	1	Presence/Absence	Optimal
2013-2018	04	G 59774 34778	1	0	1	Presence/Absence	Optimal
2013-2018	05	G 60179 34998	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	06	G 59986 35047	1	0	1	Presence/Absence	Optimal
2013-2018	07	G 60408 34953	0	0	0		Optimal
2013-2018	08	G 60654 35489	1	0	1	Presence/Absence	Optimal
Monitoring period 2007-2012 (24 samples)							
2007-2012	01	G 59387 34514	0	0	1		
2007-2012	02	G 59351 34349	0	0	1		
2007-2012	03	G 59355 34203	0	0	1		
2007-2012	04	G 59440 34126	0	0	1		
2007-2012	05	G 59539 34074	0	0	1		
2007-2012	06	G 59589 34072	0	0	1		
2007-2012	07	G 59580 34147	0	0	1		
2007-2012	08	G 59561 34217	0	0	1		
2007-2012	09	G 59553 34280	0	0	1		
2007-2012	10	G 59617 34350	0	0	1		
2007-2012	11	G 59520 34381	0	0	1		
2007-2012	12	G 59467 34442	0	0	1		
2007-2012	13	G 59487 34555	0	0	1		
2007-2012	14	G 59594 34535	0	0	1		
2007-2012	15	G 59699 34545	0	0	1		
2007-2012	16	G 59771 34691	0	0	1		
2007-2012	17	G 59674 34729	0	0	1		
2007-2012	18	G 59562 34693	0	0	1		
2007-2012	19	G 59557 34793	0	0	1		
2007-2012	20	G 59564 34892	0	0	1		
2007-2012	21	G 59625 35006	0	0	1		
2007-2012	22	G 59717 34948	0	0	1		
2007-2012	23	G 59776 34929	0	0	1		
2007-2012	24	G 59846 34859	0	0	1		

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in all 3 of the habitat zones on the transect (from	Present in all 3 zones (4 sampled)	Pass

2013-2018			at least 4 samples)		Pass
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in all 3 of the habitat zones on the transect (from at least 4 samples)	Present in all 3 zones (4 samples)	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in at least 6 other places at the site with a wide geographical spread (minimum of 8 sites sampled)	Present at 7 other locations (8 sampled)	Pass
2007-2012	Presence/Absence	Adult or sub-adult snails are present in at least 6 other places at the site with a wide geographical spread (minimum of 8 sites sampled)	Present in 24 (from 24 samples)	Pass

Mon. period	Population Notes
2013-2018	The 2007-2012 monitoring survey recorded Vertigo angustior at four out of four locations on the transect, and 24 out of 24 locations across Polygon A. The current survey had positive samples for the target species at four out of four locations on the transect, and seven out of eight samples across polygons A, B and E. The only negative sample was one of two samples taken within the golf course itself (Polygon E), and in fact here a juvenile Vertigo angustior was recorded. However, to count as a positive sample point according to Moorkens & Killeen (2011), the shell must be from an adult or sub-adult. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment is Favourable (green).
2007-2012	the snail is widespread in its distribution and frequently present in moderate to good numbers

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	50m of habitat along the Transect is classed as Optimal-Suboptimal or better AND 10m of habitat along the Transect is classed as Sub-optimal or better	60m is Optimal-Suboptimal	Pass
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 50m of the Transect	60m is Optimal wetness	Pass
2007-2012	1	Habitat extent	50m of habitat along the Transect is classed as Optimal and 10m of habitat along the Transect is classed as Sub-Optimal or Optimal	60m is Optimal	Pass
2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 50m of the Transect	60m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	45-55ha of the site optimal and sub-optimal	54.6ha Optimal and Suboptimal	Pass
2007-2012	Habitat extent	45-55 ha of the site optimal and sub-optimal	54.4 ha suitable	Pass

Mon. period	Habitat Notes
2013-2018	Of the five polygons (A-E) delineated in the 2007-2012 monitoring period, the current monitoring survey saw Polygon A drop slightly from Optimal to Optimal-Suboptimal due to vegetation becoming slightly more rank. All other polygons remained at the same status. The full length of the transect (60m) was classed as Optimal in 2010, and Optimal-Suboptimal in the current monitoring period, reflecting the use of a five-point scale in this survey (rather than three-point scale used by Moorkens & Killeen). Therefore, based on the criteria of Moorkens & Killeen (2011), along with a small amendment to take account of the use of the five-point scale, the Habitat Assessment for Ballysadare Bay is Favourable (Green).
2007-2012	Much of the habitat at the site appears to be in good condition for V. angustior

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	G01.02	walking, horseriding and non-motorised vehicles	Inside	Low	Negative	5%	In some areas, trampling and blow-outs caused by excessive walking or large tracks
2013-2018	G02.01	golf course	Inside	Medium	Negative	36%	Tight mowing, reseeding & fertiliser are all unsuitable management for Vertigo angustior
2013-2018	G02.08	camping and caravans	Inside	Low	Negative	2%	Fires and trampling
2013-2018	I02	problematic native species	Inside	High	Negative	1%	Some areas covered in thick blanket of Ivy, shading out habitat for Vertigo angustior
2013-2018	K01.01	Erosion	Inside	Low	Negative	2%	Loss of habitat, but natural process
2007-2012	K02.01	species composition change (succession)	Inside	Medium	Neutral	24ha	The lack of grazing management is having a neutral affect at present, as the habitat is mainly managed by exposure, and is on the less fixed end of the spectrum of fixed dune habitat. Over a long period of time succession may result in the vegetation becoming too rank for the snail, with vegetation litter and ultimately soil building up future vegetation litter decay taking place in a higher and drier micro-habitat. This should be monitored and if the spread and density of V. angustior reduces, active management could then be considered.

Mon. period	Future Prospects Notes
2013-2018	Future prospects for Vertigo angustior at this site are deemed to be good, though if there is any further rank/dense vegetation growth, in Polygon A in particular, this may become an issue in the future. Other threats to the snail's continued survival at the site include the negative effects of trampling and blowouts, but all other impacts are on a very small scale in this large site. For this reason, the future prospects of the site are considered to be Favourable (green).
2007-2012	As the impact is unlikely to be negative for the foreseeable future and could be remedied before damage through careful monitoring, Future prospects have been assessed as Favourable

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Green	Green	Green	Green
2007-2012	Green	Green	Green	Green

Mon. period	Overall Notes
2013-2018	Given that the Population and Habitat Assessments, as well as the Future Prospects, are all Favourable (green), the Overall Assessment is Favourable (green).
2007-2012	The Condition of the site and the feature based upon the 2010 survey has been assessed as Favourable, and has not changed since the last (2006) survey

6. DISCUSSION

Monitoring period
2013-2018

Vertigo angustior monitoring at Ballysadare Bay

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the fixed dune habitat along the length of the peninsula. Access is from the beach at Strandhill, or through the golf club with permission.

Discussion:

The site at Ballysadare Bay supports extensive Vertigo angustior habitat and a good population of the snail, with adult snails found at all but one of the twelve sample locations (and a juvenile Vertigo angustior was found at this sample location within the golf course). The habitat comprises extensive fixed dune, with a good Festuca rubra thatch in places under Ammophila arenaria. While the habitat is good for the snail, there is some indication that it may be becoming rank, particularly in Polygon A. Some areas have been affected by trampling and blowouts (polygons B and C), while the maintenance of the golf course has limited suitable habitat to areas of rough within its footprint (Polygon E). Management actions are necessary to address some of the issues at the site including potentially introducing light cattle grazing to Polygon A, a more sensitive mowing regime for roughs on the golf course, and measures to address the negative effects of trampling and to allow the revegetation of blowout areas.

Monitoring recommendations:

Monitoring should be carried out at three-yearly intervals to ensure that no major changes occur to the site, particularly in terms of the management activities. The monitoring should follow that proposed by Moorkens & Killeen (2011), as outlined below:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too dry, Optimal wetness or Too wet, respectively
- Take at least 4 samples from the 3 zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 8 other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

Due to its large area and the habitat present, the management of Polygon A is particularly important. Light cattle grazing could be considered as it is likely to be beneficial in terms of opening up the vegetation, which is developing into a tall, rather dense Ammophila arenaria/Arrhenatherum elatius sward. There should be no supplementary feeding if animals are introduced, and regular monitoring is required to ensure that grazing is having the desired effect. Should this management intervention be considered, then it should be implemented with caution, with full advice from a Vertigo angustior expert, and effects should be monitored twice per year.

Polygons B and C, in the middle of the site, require some action to reduce the effects of walkers on the vegetation. This trampling may have contributed to the blowout that makes up most of Polygon C. Action should also be taken to stabilise the sand within the blowout and allow the re-establishment of fixed dune vegetation to provide suitable habitat for Vertigo angustior. The erection of fences to funnel walkers and protect the most vulnerable areas is recommended.

The management of the golf course (Polygon E) could be altered to create habitat more suitable for Vertigo angustior in the roughs. The effect of mowing in the various grades of rough could be made more positive by raising the mower height setting and by reducing the frequency of mowing to allow a good Festuca rubra thatch to develop. The golf course managers are amenable to suggestions as to how to better manage their course for nature conservation.

Vertigo angustior monitoring at Ballysadare Bay

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior within this cSAC is the fixed dune habitat along the length of the peninsula. Access is from the beach at Strandhill.

Discussion:

The highly attractive site is one of the most undisturbed dune sites in the country. Although important more for its size and intact nature than for its botanical diversity, and as was stated after the 2006 survey (Moorkens 2007) the very large area of the habitat that is present makes it probably the largest single uninterrupted area of V. angustior in Ireland, and probably in Europe.

It is important to ensure that no adverse changes are allowed to occur in the area, and that the requirements of the snail habitat are not compromised for other conservation priorities. Due to the importance of this site for Vertigo angustior, the habitat should be placed under regular surveillance to ensure that it is being maintained in favourable conservation status in the short to medium term. This site should also form part of a suite of important flora and fauna sites for long term surveillance studies in anticipation of potential effects of climate change.

Monitoring recommendations:

Given the site is in excellent Condition, both in terms of habitat and Vertigo angustior distribution and abundance, it is recommended that monitoring is carried out at 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2013
Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take at least 4 samples from the 3 zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 8 other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Management recommendations:

Existing Management

The V. angustior habitat has been divided into 5 polygon areas. Areas A-D are all unmanaged at present, while E is managed as a golf course (and is outside the cSAC area). The snail is present in unmanaged parts of the gold course (roughs). In areas A to D, management is natural, through exposure to wind and water spray and low levels of public trampling.

Proposed management prescription for site

The site is currently in excellent condition for the snail, and no change of management is recommended between the periods 2010-2013. The high exposure of this windswept peninsula appears to be maintaining the ideal conditions for the snail. The site should be monitored to ensure that the situation remains like this in the medium to long term, and any management introduced for other purposes, such as maintenance of the Annex I habitats should only be considered if it does not interfere with the favourable condition of the snail.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Strandhill Airport

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM21 **County:** Sligo

SAC Site Code: 000627 Cummeen Strand/Drumcliff Bay (Sligo Bay)

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	12-15 July 2016	John Brophy & Maria Long
2007-2012	18 May 2010	Ian Killeen & Maria Long

1.2 General Habitat Description (from baseline survey):

The general habitat in which Vertigo angustior is present is fixed grey dunes (Annex I 2130, CORINE 16.22) (Romão, 1996; Devillers et al., 1991). The microhabitat of the snail is the decaying vegetation and living and decaying moss in the litter layer of the unshaded fixed dune habitat. The dominant vegetation is Festuca rubra, with some Ammophila arenaria higher up, corresponding to SD7 of Rodwell (2000), and Galium verum, Pilosella officinarum, Plantago lanceolata, Poa sp, Holcus lanatus, Thymus polytrichus, Carex arenaria, and coastal mosses, corresponding to SD8 of Rodwell (2000). The habitat falls within the more general habitat of fixed dunes (CD3) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Fixed dune, species-rich grassland dominated by Festuca rubra, with sparse Ammophila arenaria, Geum verum, Euphrasia sp. Pilosella officinarum and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch.
Sub-optimal	Vegetation composition as above but either vegetation height is less than 10cm or between 30 and 50cm, or the vegetation contains mounds of moss or willow scrub, or the soil is dry and sandy, or the thatch is wetter with a denser structure.
Unsuitable	Not defined

2. SUMMARY:

The Vertigo angustior population at Strandhill appears to have declined since the 2007-2012 monitoring period, with some decline in habitat quality evident along the transect and in Polygon C. The high cover of Arrhenatherum elatius, particularly Polygon B and E, suggest the habitat has become rank through lack of grazing (by rabbits or livestock), and therefore is less suitable for supporting the target species. Natural succession to a more stable fixed dune habitat is also occurring. Lack of grazing has been identified as the main threat to the site, with coastal erosion also of concern. Historical conifer planting along the eastern boundary of the site has led to the loss of potentially suitable habitat, as has construction of the airport and the sewage treatment works.

Management of the site should include the introduction of grazing to counter the transition to rank vegetation, and to encourage a return to a more Ammophila arenaria-Festuca rubra dominated sward. Monitoring of the grazing level would be required to ensure a positive effect.

Site managers, site users and NPWS staff should meet in the near future to discuss the conservation issues and challenges at this important site, and to decide on the relative priorities. This site is important for a suite of other uncommon plants, animals and habitats, any actions taken must bear this in mind.

3. TRANSECT DETAILS

TRANSECT: 1 **MONITORING PERIOD:** 2013-2018

Start point:	G 60561 36432	Eroded away, former start point and zone 1 no longer present	
End point:	G 60724 36440		
Transect length:	170	**Direction:**	As for 2010
Description:	As for 2010		
Sampling frequency:	As for 2010		

Vertigo angustior monitoring at Strandhill Airport

TRANSECT: 1 **MONITORING PERIOD:** 2007-2012

Start point:	G 60557 36326	The transect runs from a high point on the dunes at the cliff edge path	
End point:	G 60725 36444	Fencepost	
Transect length:	170.5	**Direction:**	SW-NE
Description:	The transect runs down an undulating dune slope through a dryish slack and back into dune grassland with dense mosses and willow scrub. The transect is crossed by several paths.		
Sampling frequency:	Starting at the 0 metre end, the habitat (at the plant community level) along the tape was described and the linear distance of that habitat type measured. This was repeated every time the habitat changed, thereby delineating uniform plant community zones along the transect. Six samples were taken at various intervals along the transect principally from zones with optimal and sub-optimal habitat and analysed in the laboratory for their snail composition		

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	11.2291	Polygon A status remains Optimal. This area consists of fixed dune habitat with Ammophila arenaria and Festuca rubra throughout, though variable in density and thatch quality.
B	Suboptimal	6.733	Polygon B status remains Suboptimal. While the western portion is mainly Arrhenatherum elatius, with no Ammophila arenaria or Festuca rubra, the eastern part is more similar to Polygon E with some parts rank and others with reasonable Festuca rubra thatch, but with a dense moss layer throughout.
C	Suboptimal	2.5141	Polygon C status dropped to Suboptimal as large areas of the polygon are rank with dense tussocks of Ammophila arenaria and others with mounds of deep, dense moss. Festuca rubra thatch is very patchy. It is not clear if this change in ecological or down to interpretation.
D	Suboptimal	5.8464	Polygon D status remains Suboptimal. The habitat is good quality in places, but some areas have very short vegetation and some with dense moss cover. Festuca rubra thatch is patchy. Some areas with Salix repens.
E	Suboptimal	9.4511	Polygon E status increases to Suboptimal. It is unclear whether this increase is due to interpretation or actual ecological change. The polygon is somewhat rank and mossy, but with good cover of Festuca rubra thatch in places.
F	Unsuitable	21.388	Polygon F remains unsuitable. This is the within boundary of the airport, where the grass is tightly mown.
G	Suboptimal-Unsuitable	4.0074	Polygon G increases to Suboptimal-Unsuitable. This is considered to be ecological change due to the vegetation recovering from overgrazing by cattle. The habitat supports good quality Festuca rubra thatch, with scattered Ammophila arenaria. Some areas are unsuitable due to dense Arrhenatherum elatius, Dactylus glomerata and Agrostis stolonifera.
H	Unsuitable	9.9856	Polygon H remains Unsuitable. This polygon consists mostly of conifer plantation.

Monitoring Period: 2007-2012

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal	11.224	Polygon A - fixed dune grassland
B	Sub-optimal	6.732	Polygon B - fixed dune grassland but much of it becoming vegetated with dense moss and some willow scrub, also includes an area of slack
C	Optimal	2.51	Polygon C - fixed dune grassland
D	Sub-optimal	5.846	Polygon D - mostly fixed dune grassland
E	Sub-optimal with unsuitable areas	9.45	Polygon E - taller denser grassland with some woodland
F	Unsuitable	21.387	Polygon F - main airport runway and surrounds
G	Unsuitable	4.007	Polygon G - much of the grassland heavily grazed and damaged, also includes STW compound
H	Unsuitable	9.986	Polygon H - mostly conifer forest, occasional small patches of sub-optimal habitat

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Vertigo angustior monitoring at Strandhill Airport

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	55m		41.5m	60m	13.5m	155m		15m

Monitoring period: 2007-2012

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
1	48.5m	NA	90m	NA	32m	143.7m	20m	6.8m

Transect samples

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 Transect 1 (5 samples)								
2013-2018	1	1	16m	1	0	1	Presence/Absence	Optimal-Suboptimal
2013-2018	1	2	26m	1	0	1	Presence/Absence	Optimal
2013-2018	1	3	46m	0	0	0		Optimal
2013-2018	1	4	83m	0	0	0		Optimal-Suboptimal
2013-2018	1	5	156.5m	0	0	0		Suboptimal
Monitoring period 2007-2012 Transect 1 (6 samples)								
2007-2012	1	1	6.5m	3	3	6		
2007-2012	1	2	24m	2	3	5		
2007-2012	1	3	67m	0	0	0		
2007-2012	1	4	83m	1	0	1		
2007-2012	1	5	120m	0	0	0		
2007-2012	1	6	157m	1	1	2		

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 (9 samples)							
2013-2018	01	G 60839 36172	0	0	0		Optimal
2013-2018	02	G 60739 36532	0	0	0		Optimal-Suboptimal
2013-2018	03	G 60531 36912	1	0	1	Presence/Absence	Optimal
2013-2018	04	G 60563 36768	0	0	0		Optimal
2013-2018	05	G 60644 36521	0	0	0		Optimal-Suboptimal
2013-2018	06	G 60820 36832	0	0	0		Suboptimal
2013-2018	07	G 60423 37166	0	0	0		Optimal
2013-2018	08	G 60581 37215	0	0	0		Optimal
2013-2018	09	G 61226 37205	0	0	0		Optimal-Suboptimal
Monitoring period 2007-2012 (19 samples)							
2007-2012	01	G 60666 36495	0	0	1		
2007-2012	02	G 60639 36515	0	0	1		
2007-2012	03	G 60627 36535	0	0	1		
2007-2012	04	G 60649 36600	0	0	0		
2007-2012	05	G 60644 36651	0	0	0		
2007-2012	06	G 60610 36767	0	0	1		
2007-2012	07	G 60650 36820	0	0	1		
2007-2012	08	G 60497 36923	0	0	1		
2007-2012	09	G 60482 36941	0	0	0		
2007-2012	10	G 60458 36952	0	0	1		

2007-2012	11	G 60530 36858	0	0	1
2007-2012	12	G 60565 36765	0	0	1
2007-2012	13	G 60592 36721	0	0	1
2007-2012	14	G 60587 36540	0	0	0
2007-2012	15	G 60572 36392	0	0	1
2007-2012	16	G 60581 36336	0	0	0
2007-2012	17	G 60648 36297	0	0	0
2007-2012	18	G 60710 36198	0	0	0
2007-2012	19	G 60710 36157	0	0	0

5. CONDITION ASSESSMENT

5.1 Population Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Presence/Absence	Adult or sub-adult snails are present in 4 of the grassland zones with optimal or sub-optimal habitat (minimum 5 samples)	Present in 2 zones	Fail
2007-2012	1	Presence/Absence	Adult or sub-adult snails are present in 4 of the grassland zones with optimal or sub-optimal habitat (minimum 5 samples)	Present in 4 zones	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	Adult or sub-adult snails are present in at least 6 other places at the site with a wide geographical spread (minimum of 8 sites or 75% of sites sampled)	Present in 1 other location (9 samples)	Fail
2007-2012	Presence/Absence	Adult or sub-adult snails are present in at least 6 other places at the site with a wide geographical spread (minimum of 8 sites or 75% of sites sampled)	at 10 other locations (from 19 samples)	Pass

Mon. period	Population Notes
2013-2018	In the 2007-2012 monitoring period, the population assessment was Favourable (green), with four out of six samples on the transect positive for Vertigo angustior, and 10 out of 19 spot samples positive. In the current survey, two out of five samples on the transect were positive, while one out of nine spot samples were positive. Based on the criteria of Moorkens & Killeen (2011), the Population Assessment for Strandhill Airport is Unfavourable Bad (red).
2007-2012	the snail is scattered in its distribution and present in rather low numbers

5.2 Habitat Assessment: 3 passes Favourable (green); 2 passes Unfavourable Inadequate (amber); 0-1 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	1	Habitat extent	75m of habitat along the Transect is classed as Optimal and 150m of habitat along the Transect is classed as Sub-Optimal or Optimal	55m is Optimal AND 96.5m is Suboptimal or Optimal	Fail
2013-2018	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for >130m along the Transect	155m is Optimal wetness	Pass
2007-2012	1	Habitat extent	75m of habitat along the Transect is classed as Optimal and 150m of habitat along the Transect is classed as Sub-Optimal or Optimal	48.5m is Opt &138.5m is Sub-Opt or Optimal	Fail

2007-2012	1	Habitat quality	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for >130m along the Transect	143.7m is optimal wetness	Pass

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	12-15ha of the site optimal and a further 11-14 ha sub-optimal	11.2ha Optimal and 24.6ha Suboptimal	Fail
2007-2012	Habitat extent	12-15 ha of the site optimal and a further 11-14 ha sub-optimal	13.7 ha optimal and 6.7 sub-optimal	Pass

Mon. period	Habitat Notes
2013-2018	In the monitoring period 2007-2012, polygons A and C were classified as Optimal, B and D as Suboptimal, E as Suboptimal-Unsuitable and F, G and H as Unsuitable. Following the current survey, Polygon C was downgraded to Suboptimal due to the rank tussocks of Ammophila arenaria and dense moss, with little Festuca rubra thatch. It is not known whether this due to ecological change or interpretation. Polygon E was upgraded to Suboptimal due to the presence of good thatch in places, and this change is likely to be due to interpretation. Polygon G was upgraded to Suboptimal-Unsuitable due to ecological change as the vegetation has recovered from heavy cattle grazing. The start of the transect has been lost through coastal erosion. Based on the criteria of Moorkens & Killeen (2011), the Habitat Assessment for Strandhill Airport is Unfavourable Bad (red).
2007-2012	much of the habitat at the site appears to be in good condition for V. angustior

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.03	abandonment of pastoral systems, lack of grazing	Inside	Medium	Negative	75%	Grazing needed in some areas
2013-2018	B01.02	artificial planting on open ground (non-native trees)	Inside	High	Negative	3%	Conifers planted to restrict sand blowing
2013-2018	D01.01	paths, tracks, cycling tracks	Inside	Medium	Negative	1%	Walking trail/tracks.
2013-2018	D04.01	airport	Inside	High	Negative	1%	Sligo airport. Only impacting slightly into polygons with potenitally suitable habitat.
2013-2018	G02.07	sports pitch	Outside	Low	Negative	5%	Increased human activity due to campsite
2013-2018	K01.01	Erosion	Inside	High	Negative	2%	Loss of fixed dune habitat
2013-2018	K02.01	species composition change (succession)	Inside	Medium	Negative	40%	Succession to mores stable fixed dune with deep mossy layer occurring in polygons B & E
2007-2012	A04.01.01	intensive cattle grazing	Inside	High	Negative	3ha	Refers to Polygon G, where cattle numbers are so great at times that the ground is poached to bare sandy mud.
2007-2012	A04.03	abandonment of pastoral systems, lack of grazing	Inside	Medium	Negative	24ha	Refers to the public dunes, which were probably grazed in the past, but are now being managed by trampling and exposure, and are being encroached by scrub in places.

2007-2012	B01	forest planting on open ground	Inside	High	Negative	10ha	The artificial planting refers to the conifer plantation on fixed dune habitat that still retains crumbs of V. angustior habitat. This habitat area is likely to be restorable.
2007-2012	B06	grazing in forests/ woodland	Inside	Medium	Negative	2ha	The northern part of the plantation is grazed by cattle and badly poached and in consequence is less restorable.
2007-2012	D04.01	airport	Inside	Medium	Negative	21ha	The airport was built on fixed dune habitat in 1974, so much of the 21 hectares of its footprint is now unsuitable for V. angustior, but the fringe vegetation that is suitable is maintained by trampling.
2007-2012	E06	Other urbanisation, industrial and similar activities	Inside	Medium	Negative	1ha	Refers to the Strandhill Waste Water Treatment Plant, which sits on further former habitat, and there is considerable disturbance to the vegetation in its vicinity.
2007-2012	G02.08	camping and caravans	Outside	Medium	Negative	3ha	Refers to the caravan site on former fixed dune habitat. Although this site has a long history, the fixed dunes to the north of the caravans are heavily trampled and have higher human pressure than would be desirable at a prime dune site.
2007-2012	M01.01	temperature changes (e.g. rise of temperature & extremes)	Inside	Low	Negative	70ha	deal with the potential for climate change impacts, in a site which relies on a dominance of very damp conditions and high rainfall rather than groundwater sources to keep the habitat and particularly the litter layer moist
2007-2012	M01.02	droughts and less precipitations	Inside	Low	Negative	70ha	

Mon. period	Future Prospects Notes
2013-2018	There are a number of factors affecting the Vertigo angustior habitat at Standhill Airport. A lack of grazing is considered the main negative impact, resulting in the site becoming rank. Other impacts include coastal erosion, conifer plantations, paths & tracks, and buildings/activities such as the airport and the sewage treatment works. Considering these impacts along with the apparent reduction in the population of Vertigo angustior at the site, the Future Prospects for Strandhill Airport are considered to be Unfavourable Inadequate (amber).
2007-2012	Due to the combination of the retention of a large habitat area, but with a variety of pressures acting on the site, Future prospects have been assessed as Unfavourable inadequat

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Red	Red	Amber	Red
2007-2012	Green	Amber	Amber	Amber

Mon. period	Overall Notes
2013-2018	While the Future Prospects for the site are Unfavourable Inadequate (amber), the results of the population and habitat assessments result in an Overall Assessment for Strandhill Airport of Unfavourable Bad (red).

2007-2012	The Condition of the site and the feature based upon the 2010 survey has been assessed as Unfavourable Inadequate. This represents deterioration since 2006, when the site was assessed as Favourable. However, this is still a very good site for V. angustior

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: The habitat that supports Vertigo angustior within this SAC is the fixed dune habitat in the area surrounding Sligo Airport. Access is from the pedestrian path to the south of the airport.

Discussion:

The Vertigo angustior population at Strandhill Airport appears to have declined since the 2007-2012 monitoring period, with some decline in habitat quality evident along the transect and in Polygon C. The high cover of Arrhenatherum elatius, particularly polygons B and E, suggest the habitat has become rank through lack of grazing (by rabbits or livestock), and therefore is less suitable for supporting the target species. Natural succession to a more stable fixed dune habitat is also occurring. Lack of grazing has been identified as the main threat to the site, with coastal erosion also of concern. Historical conifer planting along the eastern boundary of the site has led to the loss of potentially suitable habitat, as has construction of the airport and the sewage treatment works.

Management of the site should include the introduction of grazing to counter the transition to rank vegetation, and to encourage a return to a more Ammophila arenaria-Festuca rubra dominated sward. Monitoring of the grazing level would be required to ensure a positive effect.

Site managers, site users and NPWS staff should meet in the near future to discuss the conservation issues and challenges at this important site, and to decide on the relative priorities. This site is important for a suite of other uncommon plants, animals and habitats, any actions taken must bear this in mind.

Monitoring recommendations:

This is an important site and the population of Vertigo angustior appears to be decreasing, so monitoring should be carried out at three-yearly intervals. This should be increased to yearly, for at least three years, if grazing or other management changes are made. The monitoring should follow that proposed by Moorkens & Killeen (2011), with some alterations as shown below:

- Repeat Transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable or Unsuitable, and Too dry, Optimal wetness or Too wet, respectively
- Take 1 sample each from at least 5 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of nine other locations (with a wide geographical spread) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for Vertigo angustior
- Use results to determine overall condition assessment

Management recommendations:

Some light grazing by cattle would benefit Vertigo angustior in a number of areas at this site, as the vegetation is becoming rank and unsuitable for supporting the snail. Grazing would be likely to reduce the size and cover of large Ammophila arenaria tussocks and allow the cover of Festuca rubra to increase. The grazing level would need to be closely monitored to ensure overgrazing does not occur, with cattle numbers or the period of grazing adjusted accordingly. The main areas to focus on are Polygon C and D, and perhaps the northern portion of Polygon A - it is here that the snail appears to have been lost from. Polygons B and E may also benefit from grazing, but processes of succession to more stable fixed dune habitat, with dense moss layer, may be harder to slow/reverse in these areas.

The main part of this site that continues to support the target species is the coastal strip of Polygon A. Here, no management intervention is needed. The main threat is habitat loss through erosion, but coastal defence works are not recommended as part of this survey.

Site managers, site users and NPWS staff should meet in the near future to discuss the conservation issues and challenges at this important site, and to decide on the relative priorities. This site is important for a suite of other uncommon plants, animals and habitats, and any actions taken must bear this in mind.

Vertigo angustior monitoring at Strandhill Airport

2007-2012

Area of occupancy: The habitat that supports Vertigo angustior within this SAC is the fixed dune habitat in the area surrounding Sligo Airport. Access is from the pedestrian path to the south of the airport.

Discussion:

The Condition of the site and the feature based upon the 2010 survey has been assessed as Unfavourable Inadequate. This represents deterioration since 2006, when the site was assessed as Favourable (see Appendix). However, this is still a very good site for V. angustior, which in parts includes a densely thatched litter layer in a naturally calcareous stable environment that is managed well by the elements rather than by active grazing. The wider habitat areas, dune and slack, are botanically rich and thus the overall importance of this cSAC in international terms is high.

Results and observations from the present survey in addition to results from other surveys undertaken for NPWS indicate that there is a contraction in the area of good V. angustior habitat and also in the range and abundance of the snail. The best V. angustior habitat is present mostly along the fixed dune coastal strip, particularly towards the northern end of the site. On the landward side of the dunes much of the habitat is becoming dominated luxuriant mounds of moss (Rhytidiadelphus spp.) and willow scrub, suggesting parts of the site may be becoming drier and/or less calcareous. The numbers of V. angustior in 2010 on the transect are much lower than recorded in 2006. Whilst populations of V. angustior are known to fluctuate in abundance and small-scale distribution, the recent pattern of long wet summers followed by stormy wet winters may mean that the conditions for V. angustior at the site are becoming less favourable. This site needs careful monitoring with a view to possibly needing conservation management (strimming or grazing) in the future, but a further round of monitoring is recommended in order to ascertain how fluctuating the numbers of snails are from year to

Monitoring recommendations:

Given the evidence for an overall deterioration in the Condition of the site, both in terms of habitat and Vertigo angustior distribution and abundance, it is recommended that monitoring is carried out at a minimum of 3 yearly intervals. This should be re-assessed in light of any deterioration of Condition or any changes to site management:

Frequency: Next monitoring due 2013
Methods (see Section 3 of main report for full details). Assessment of the transect and other locations with snail sampling, plus assessment of condition of polygon. Prescription as follows:
- Repeat transect 1, delineate the plant community/habitat zones, and assign the habitat and wetness in each zone as Optimal, Sub-optimal or Unsuitable
- Take 1 sample each from at least 5 of the main zones with the most suitable habitat on the transect and analyse for molluscan composition
- Describe habitat and take 1 sample from the most suitable habitat in each of 8 other locations (with a wide geographical spread, in Polygon area A) and analyse for molluscan composition
- Re-determine boundary of the habitat polygons and assign habitat to either Optimal, Optimal & Sub-optimal, Sub-optimal, Sub-optimal and Unsuitable, or Unsuitable
- Assess the management regime and impacts upon the habitat for V. angustior
- Use results to determine overall condition assessment

Additional surveillance at 6 yearly intervals:

Frequency: Next monitoring due 2016
Methods (see Section 3 of main report for full details). Prescription as follows:
- Describe habitat and take at least 2 samples from the most suitable habitat in each of Polygon areas B, C, D and E, and analyse for molluscan composition

Management recommendations:

Existing Management

There is no active management by grazing at the publicly owned land at this site. There is some irregular mowing close to the airport runway. Vertigo angustior is maintained at the habitat by light trampling and by exposure and dampness. There are areas of low pockets and dry slack habitat that have some willow, but this is not part of the area of occupancy of V. angustior.

Proposed management prescription for site

The management at this site should remain the same as the present regime without active management outside the airport runway area for the 2011-2014 period. If management is recommended to be introduced for habitat or vegetation purposes, e.g. in the dry slack areas, it should not be such that would interfere with the favourable condition of V. angustior, for example any introduction of sheep grazing would be very detrimental to the snail.

Any recommendations for a change in management should be habitat based. However, any introduced management should not interfere with the V. angustior habitat elsewhere. Light cattle grazing would not interfere with the current favourable condition of the species, but sheep should not be introduced. More notices for the public could help to discourage littering, which is common in places. A site meeting of NPWS staff including all the habitat and species experts is recommended to assess if there are active conservation management measures required, but this could wait until after another round of monitoring.

Due to the importance of this site for Vertigo angustior, the habitat should be placed under regular surveillance to ensure that it is

being maintained in favourable conservation status in the medium to long term. This site should also form part of a suite of important flora & fauna sites for long term surveillance studies in anticipation of potential effects of climate change.

Site report - Vertigo Monitoring

Vertigo angustior monitoring at Waterstown Lough

1. SITE CODE AND LOCATION DETAILS

1.1 Site code and location

Vertigo Site Code: VaCAM22 **County:** Westmeath

SAC Site Code: n/a Not in SAC

Location description (from baseline survey):

Monitoring period	Date surveyed	Recorders
2013-2018	24 September 2015	John Brophy & Maria Long

1.2 General Habitat Description (from baseline survey):

(Habitat description written as part of 2014-17 survey) The lake and its surrounding wetland communities are arranged in distinct zones across a hydrological transition. They include open water, reed swamp, tall sedge/alkaline fen mosaic, fen-grassland transition and wet grassland. The area of habitat in which Vertigo angustior is present at this site consists of wet grassland, and more specifically, occurs along the transition zone between this habitat and the rich calcareous fen downslope of it. It is found in a band along the upper slopes of the fen at the north-east of the site and there are saturated soils throughout. Wet grassland is not an Annex I nor CORINE listed habitat, but it is important in that it supports the so called “marsh phase” or inland habitat of Vertigo angustior. This habitat matches most closely with the Rodwell categories of M28, MG10 and MG11 (Rodwell, 1991, 1992). Commonly occurring species at this site include Festuca rubra, Iris pseudacorus, Juncus inflexus, Filipendula ulmaria and Carex acutiformis. The microhabitat of the snail is the decaying vegetation at the base of taller plants (especially Festuca rubra thatch, where present), and living and decaying moss in the litter layer. The habitat falls within the general habitat of wet grassland (GS4) of Fossitt (2000).

1.3 Definition of habitat types (from baseline survey):

Optimal	Transition zone between fen and wet grassland, with saturated soils. Vegetation typically 15 to 60 cm tall. Good cover of Festuca rubra, with build-up of open thatch in places, and/or good bryophyte cover. Other tall species present include Iris pseudacorus, Juncus inflexus and Carex acutiformis
Sub-optimal	Vegetation either taller or shorter than above. Soils not saturated, or area under water. Thatch/moss layer absent, or thatch layer thick, heavy and choking
Unsuitable	Not defined

2. SUMMARY:

Waterstown Lough is a very important site, as it supports all three Annex II Vertigo species (Vertigo angustior, Vertigo geyeri and Vertigo moulinsiana); one of only two sites to do so in Ireland, the other being Pollardstown Fen. The Vertigo angustior population is limited in size and distribution, with the habitat restricted to the transition zone between wet grassland and fen along the north-eastern side of the site. Cattle currently have access to the habitat, which helps to maintain an open sward suitable for Vertigo angustior. Negative impacts are thought to be small in scale, but it should be noted that slow-paced hydrological change (i.e. the site drying out) cannot be ruled out. Therefore, monitoring of this site on a regular basis is important.

3. TRANSECT DETAILS

TRANSECT: 0 **MONITORING PERIOD:** 2013-2018

Start point: NO TRANSECT RECORDED

End point:

Transect length: **Direction:**

Description:

Sampling frequency:

4. RESULTS

Polygon habitat characteristics

Monitoring Period: 2013-2018

Polygon	Habitat Type	Area (ha)	Comment
A	Optimal-Suboptimal	2.6359	Polygon A is classified as Optimal-Suboptimal, and consists of an area of habitat transitional between calcareous fen and wet grassland with Iris pseudacorus.

Transect habitat characteristics (Note: only three habitat categories were used in 2007-2012 survey)

Monitoring period: 2013-2018

Transect	Optimal habitat	Optimal/Subopt.	Sub-optimal	Subopt/Unsuitable	Unsuitable	Optimal wetness	Too Wet	Too Dry
0								

Transect samples

Vertigo angustior monitoring at Waterstown Lough

Mon. period	Transect	Sample	Location	Adults	Juveniles	Total	Habitat suitability
Monitoring period 2013-2018 Transect 0 (1 sample)							
2013-2018	0	0	NO TRANSECT RECORDED				

Spot Samples

Mon. period	Sample	Grid ref.	Adults	Juveniles	Total		Habitat suitability
Monitoring period 2013-2018 (4 samples)							
2013-2018	01	N 10276 45899	0	0	0		Suboptimal
2013-2018	02	N 10335 45897	0	0	0		Suboptimal
2013-2018	03	N 10153 46031	0	0	0		Suboptimal
2013-2018	04	N 10086 46123	1	0	1	Count	Suboptimal

5. CONDITION ASSESSMENT

5.1 Population Assessment: 1 pass Favourable (green); 0 passes Unfavourable Bad (red)

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	0	N/A	NO TRANSECT RECORDED		

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Presence/Absence	At least one adult or sub-adult snail found from a minimum of four samples, taken from across the site	1 adult in S04	Pass

Mon. period	Population Notes
2013-2018	The population of Vertigo angustior at Waterstown Lough is limited in distribution and abundance. Four samples were taken across the site and only a single individual was recorded. Note that the grid reference given for the single positive sample in Moorkens & Killeen (2011) is likely to be an error, based on observation in the field and the description they provide in the site report. Based on the criteria developed in this survey the Population Assessment is Favourable (green).

5.2 Habitat Assessment: 2 passes Favourable (green); 1 pass Unfavourable Inadequate (amber); 0 passes Unfavourable Bad (red)

5.2.1 Transect level

Mon. period	Transect	Indicator	Target	Result	Pass/Fail
2013-2018	0	N/A	NO TRANSECT RECORDED		

5.2.2 Site level

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat extent	At least 2.4ha of the site should support habitat that is classed as Optimal-Suboptimal or better	2.64ha is Optimal-Suboptimal	Pass

Mon. period	Indicator	Target	Result	Pass/Fail
2013-2018	Habitat quality	Soils, at time of sampling, classed as being of Optimal wetness and possessing a layer of humid thatch at all sample locations (minimum 4 samples)	Soils of Optimal wetness at all four sample points	Pass

Mon. period	Habitat Notes
2013-2018	The area of Vertigo angustior habitat runs along the length of the north-eastern section of the site. The most suitable area is limited to a narrow band of transitional habitat between the wet grassland with Iris pseudacorus and the fen below. The polygon is classified as Optimal/Suboptimal, and wetness levels were judged to be optimal at all four sample points. Based on the criteria developed in this survey, the Habitat Assessment result is Favourable (green).

5.3 Future Prospects Assessment

Mon. period	Activity code	Activity description	Location	Intensity	Influence	Area affected	Comment
2013-2018	A04.02.01	non intensive cattle	Inside	Medium	Positive	100%	Cattle grazing helps keep

2013-2018	A04.02.01	grazing	Inside	Medium	Positive	100%	vegetation relatively open
2013-2018	F06.01	game/ bird breeding station	Inside	Low	Negative	1%	Pheasantry at north end of site
2013-2018	J02.07	Water abstractions from groundwater	Inside	Low	Negative	5%	Very difficult to assess what effect, if any, this water abstraction is having on the site. Site appears sufficiently wet.
2013-2018	K01.03	Drying out	Inside	Low	Negative	50%	Site may be drying as lake fills with reeds.

Mon. period	Future Prospects Notes
2013-2018	Activities and impacts occurring at the site include non-intensive cattle-grazing, which is considered to be having a positive effect across the whole site by keeping the vegetation reasonably open. There is a pheasant breeding enclosure at the northern end, but this is unlikely to be having an impact, apart from the small amount of land it stands on. In terms of the hydrology, which is critical at this site as with other wetlands, the site may be drying out as the lake infills and reeds extend their range into the lake (for example, the six-inch map from the early 1900s shows a much larger area of open water than that which occurs today). Water abstraction is occurring from a spring at the northern end of the site, which may have a localised negative effect on ground moisture levels. Overall, however, the Future Prospects for Waterstown Lough are currently considered to be Favourable (green).

5.4 Overall Assessment

Mon. period	Population assessment	Area of suitable habitat	Future prospects	Overall assessment
2013-2018	Green	Green	Green	Green

Mon. period	Overall Notes
2013-2018	Based on the fact that population, habitat and future prospects assessments were all considered to be Favourable (green), Overall Assessment is also Favourable (green).

6. DISCUSSION

Monitoring period

2013-2018

Area of occupancy: The Vertigo angustior habitat is limited to a band along the north-eastern side of the site. Access is via a private track accessed from the local road north of Glassan on the N55 Athlone - Ballymahon Road.

Discussion:

Waterstown Lough is a very important site, as it supports all three Annex II Vertigo species (Vertigo angustior, Vertigo geyeri and Vertigo moulinsiana); one of only two sites to do so in Ireland, the other being Pollardstown Fen. The Vertigo angustior population is limited in size and distribution, with the habitat restricted to the transition zone between wet grassland and fen along the north-eastern side of the site. Cattle currently have access to the habitat, which helps to maintain an open sward suitable for Vertigo angustior. Negative impacts are thought to be small in scale, but it should be noted that slow-paced hydrological change (i.e. the site drying out) cannot be ruled out. Therefore, monitoring of this site on a regular basis is important.

Monitoring recommendations:

Given the limited information available on the status of Vertigo angustior at this site, its importance for supporting all three Annex II Vertigo species, and the question about potential slow-paced hydrological change, it is recommended that a minimum of three-yearly monitoring be undertaken. The following actions should be undertaken:

-Take 4 samples spread across Polygon A and analyse for presence of Vertigo angustior
-Re-determine boundary of the habitat polygon and assign habitat to Optimal, Optimal-Suboptimal, Suboptimal, Suboptimal-Unsuitable, or Unsuitable
-Assess the management regime and impacts upon the habitat for Vertigo angustior
-Use results to determine overall condition assessment

Management recommendations:

The current management of the site through cattle grazing is appropriate to maintaining suitable habitat for Vertigo angustior. As the site also supports Vertigo moulinsiana and Vertigo geyeri, any changes to the management regime must be sensitive to the needs of all three species. Should the site be found to be drying out following future surveys, measures may need to be taken to quickly halt or reverse this.